ANNUAL REVIEW AND CONVENTION NUMBER

FEB 25 1936

# PAPER TRADE JOURNAL

Vol. CII FEBRUARY 20, 1936 No. 8

PAPER

EXCELSIOR
FELTS
*Made by* KNOX WOOLEN CO., *Camden, Maine*

EXCELSIOR
Knox
Woolen Co.
Camden, Me.
FELTS & JACKETS

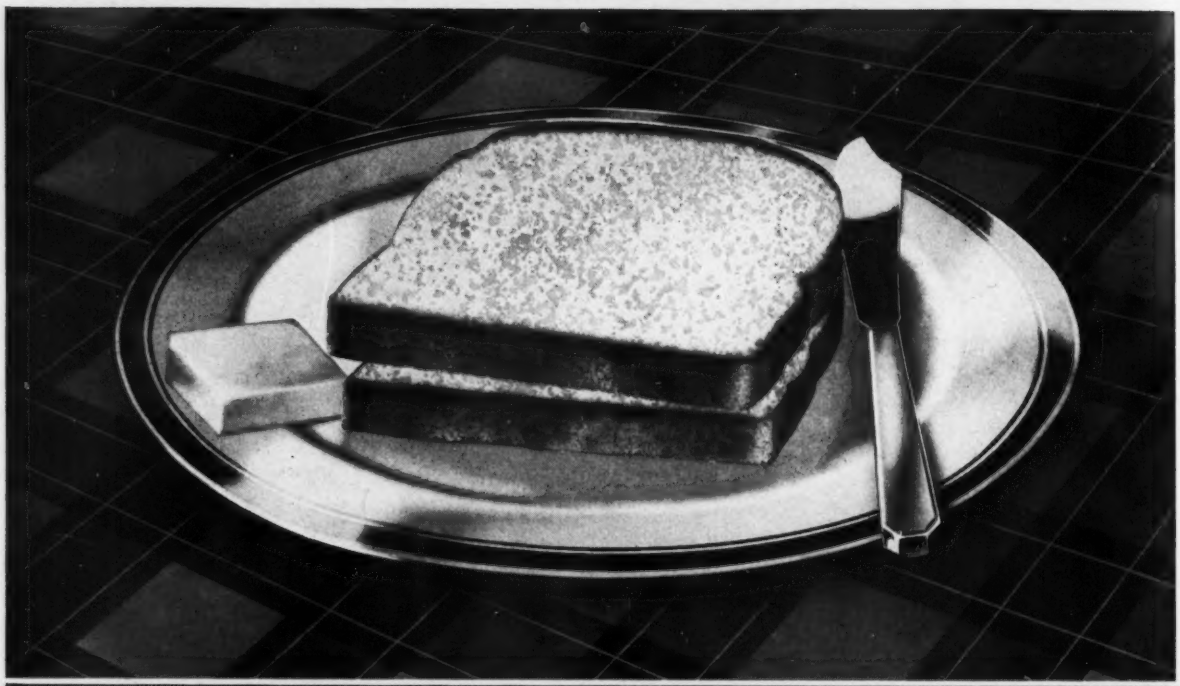
BULKLEY DUNTON & CO.
295 MADISON AVENUE
NEW YORK, N. Y.

IMPORTED DOMESTIC
PULP

ESTABLISHED in 1833

See page 55

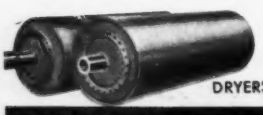
# DOWNINGTOWN

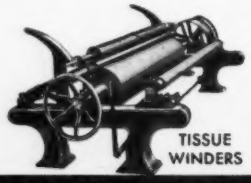


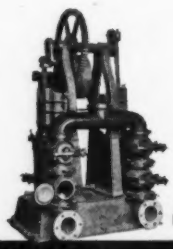
## The BREAD & BUTTER Equipment

**SUCTION COUCH ROLLS**
•
**SUCTION PRESS ROLLS**
•
**SUCTION DRUM ROLLS**
•
**SUCTION FELT CLEANING ROLLS**
•
**EXTRACTOR ROLLS**

Aside from our famous specialities listed on the left, we build a complete line of paper and board mill auxiliaries which include Beaters and almost everything down the process line to Cutters. These necessities are built the way we think is "best" for each particular type; each contains individualities of construction and design, not found in other makes . . . The next time you need any machine equipment, write us for descriptive bulletin and price; or send now for our complete catalog and keep it on file . . . The Downingtown Mfg. Co., Downingtown, Pa.


DRYERS


TISSUE WINDERS


PUMPS

CYLINDER MOULDS

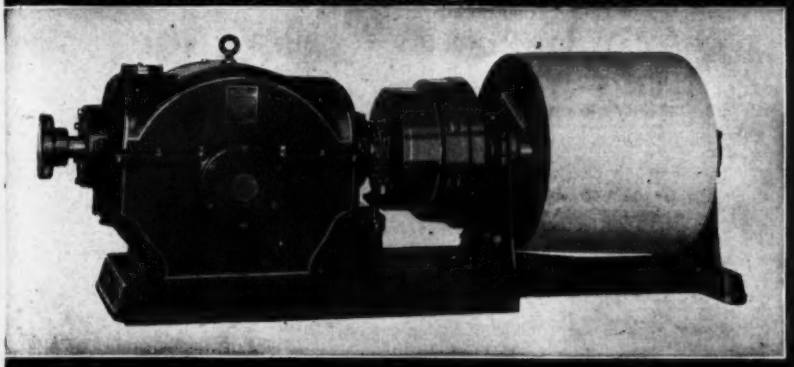
**BEATERS • FLOOR DRIVES • STEAM JOINTS • CALENDERS • REELS**


Entered as second class matter at the Post Office at East Stroudsburg, Pa., under the Act of Congress of March 3, 1879. Published every Thursday by the Lockwood Trade Journal Co., at 34 N. Crystal St., East Stroudsburg, Pa. Executive and Editorial offices: 15 W. 47th St., New York, N. Y.
Domestic subscription U. S. and possessions, $4.00 per year. This issue One Dollar.

# BELOIT DRIVE COMBINATION

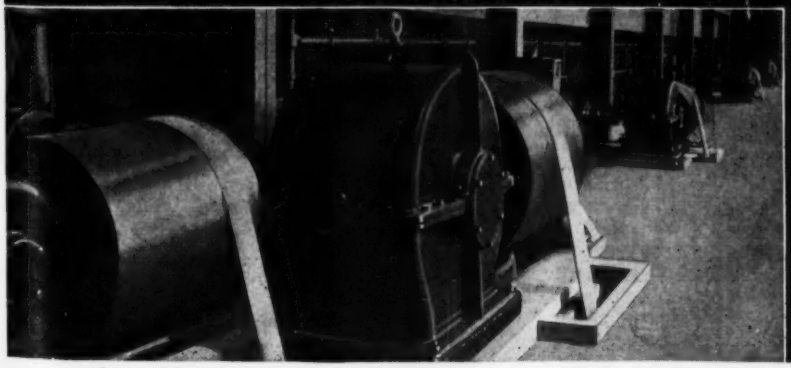
**For Modern High-Speed Machines**

**BELOIT MAGNETIC CLUTCH & HYPOID DRIVE**



**BELOIT SILENT CHAIN DRIVE . . . . . .**

**BELOIT SPIRAL BEVEL GEAR DRIVE . .**



ASSURES SMOOTHER RUNNING

SAVES POWER

SPEEDS PRODUCTION

NO BACKLASH

SAVES WEAR

SAVES MONEY

**Modernize your drive now. These improvements will pay big dividends in the future.**

**The *Beloit* Way is the *Modern* Way**

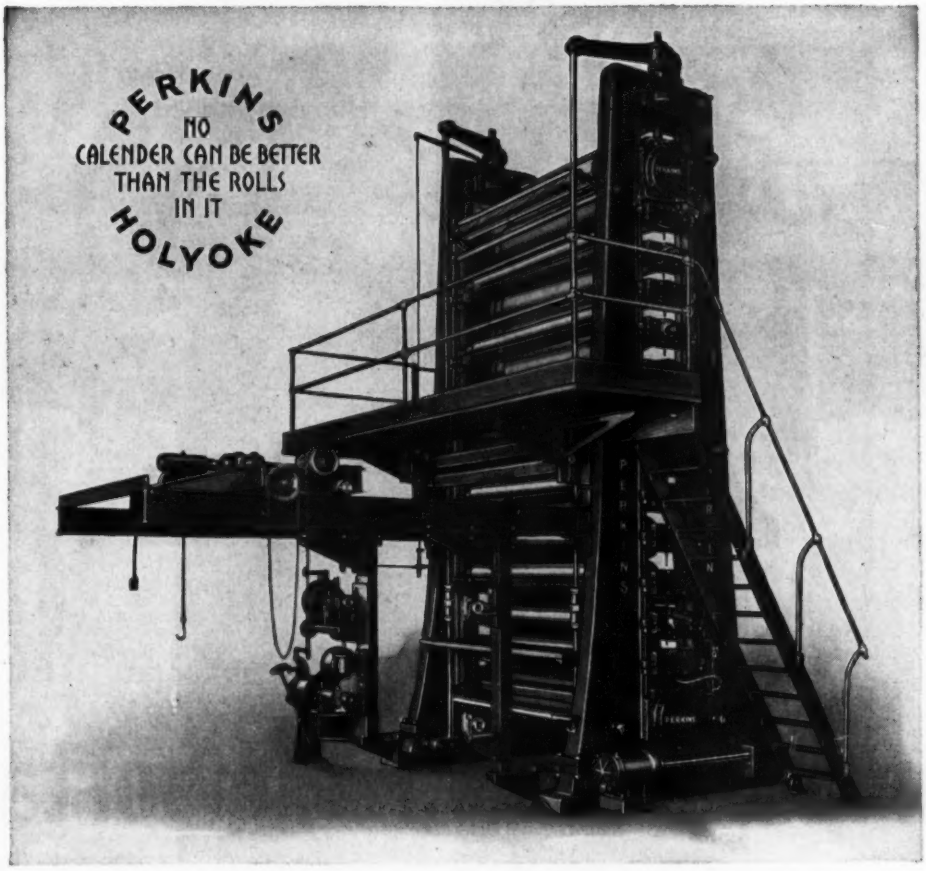
**BELOIT IRON WORKS, Beloit, Wis., U. S. A.**

For nearly half a century all our manufacturing efforts have been directed toward quality and service. From the raw wool to the finished felt there is a technical control of every step in manufacturing. Nothing is taken for granted. Every process is checked and rechecked.

Today as we are on the threshold of a new year, Appleton Felts are standard for quality and service — "APPLETON FELTS MAKE GOOD PAPER."

# APPLETON WOOLEN MILLS

Appleton, Wisconsin




Typical of Perkins Advanced Engineering is this Splendid

**FOURTEEN-ROLL WEB SUPERCALENDER**

Timken Roller Bearing Equipped Throughout

Extremely Rugged • Extra Heavy for High Speeds • Perfectly Balanced

**B. F. PERKINS & SON, INC., HOLYOKE, MASS.**

**CALENDER ROLLS**
Cotton • Interleaved (patented) • Paper

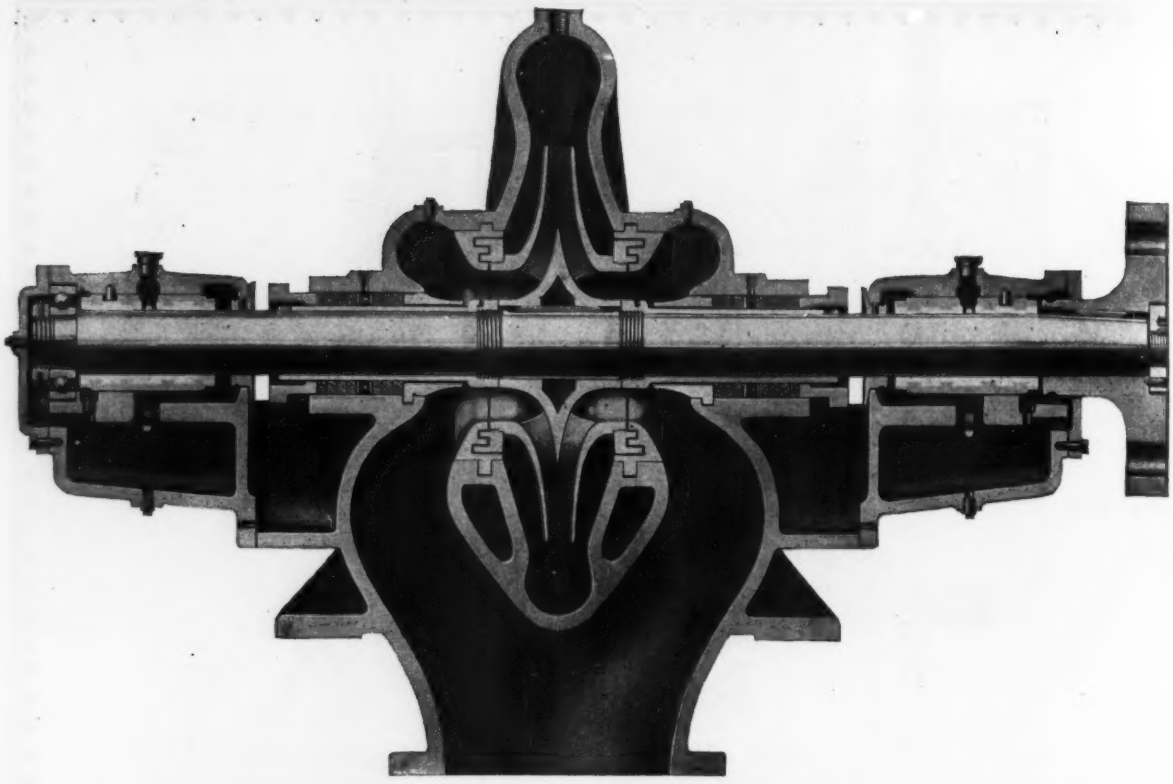
**SUPERCALENDERS**
Plain Papers • Glassine (patented) • Coated Papers

**EMBOSSING ROLLS**

**GRANITE PRESS ROLLS**

Bursting • **MULLEN PAPER TESTERS** • Tensile

**RAG AND STOCK CUTTERS**



# Pump Details are Important

NEARLY all centrifugal pumps as now manufactured follow the type of the

## DE LAVAL CENTRIFUGAL PUMP

first introduced in America in 1901.

However, there are many differences in construction which materially affect cost of operation, including upkeep expense. Take, for instance, the **SHAFT SLEEVES** which protect the shaft from corrosion and from wear by the stuffing box packings. In De Laval pumps these sleeves are screwed on the shaft, abutting the impeller to make a water-tight joint, but the sleeve is free to expand with rise in temperature and independently of the shaft, **AVOIDING THE TENDENCY TO BUCKLE** which exists where the sleeves are held at their outer ends by nuts.

Again, the bronze **WEARING RINGS** which protect the impeller and casing from wear and minimize leakage are of the **LABYRINTH TYPE**, which permits much greater mechanical clearance than is possible for the same leakage with flat rings. Due to the lower velocity of leakage through labyrinth rings, **THEY WEAR LESS AND MAINTAIN THE EFFICIENCY OF THE PUMP LONGER.**

*Ask for Catalog B*

3178

**De Laval Steam Turbine Co., Trenton, N. J.**

Manufacturers of Steam Turbines, Centrifugal Pumps, Propeller Pumps, Rotary Displacement Pumps, Centrifugal Blowers and Compressors, Worm Gears, Helical Speed Reducing Gears, Hydraulic Turbines, Flexible Couplings and Special Centrifugal Machinery. Sole Licensee of the Bauer-Wach Exhaust Turbine System.

Condor Compensated
PATENTED
TRADE MARK REGISTERED

# THE LOW TENSION RUBBER BELT

28" 9-ply Condor Compensated Belt on a Main Drive. Note low-tension sag.

## FOR MAIN DRIVES

*and other difficult service*

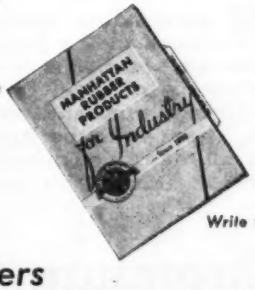
The pulley surface of Condor Compensated Belt has been engineered for low tension operation. Also it is *the* belt made to conform to the curvature of the pulley, each ply bearing an equal load when bent—the patented belt of *equalized ply stresses*. In fact, there are a dozen advantages to Condor Compensated Belt. Try it and be convinced.

**ADVANTAGES**

1. Ruptures in outside ply practically eliminated
2. Ply separation practically eliminated
3. Longer fastener life
4. Operation less affected by atmospheric conditions
5. Less bearing, shafting, and hanger troubles
6. High efficiency
7. Higher overload capacity or margin of safety
8. Less wear on pulley side
9. Can be operated on smaller pulleys
10. For heavy loads, plies may be increased with same pulleys
11. Can be dressed without destructive effect
12. Material reduction in belting costs

Condor PRODUCTS

Transmission Belt
V-Belt
Conveyor Belt
Air Hose
Contractors Hose
Sand Blast Hose
Suction Hose
Fire Hose
Hydraulic Hose
Steam Hose




Water Hose
Chute Lining
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Industrial Brake Blocks and Lining
Molded Rubber Goods
Rubber Lined Tanks
Rubber Covered Rolls

Rubber Bonded Abrasive Wheels

*Write for New Catalog*

*Sold by leading jobbers*

## THE MANHATTAN RUBBER MFG. DIVISION

OF RAYBESTOS-MANHATTAN, INC.

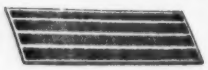
EXECUTIVE OFFICES and FACTORIES, 35 TOWNSEND STREET, PASSAIC, N. J.

The new improved

# "OPEN BACK" Screen Plate

THE conventional design of flat screen plates has remained substantially unchanged for many years. Chromium plating constituted a distinct improvement in screening procedure. With the advent of CRODON and its widespread acceptance by papermakers, the importance of proper screening received increasing recognition. Improved screening efficiency—finer slots, cleaner paper, greater capacity, longer life, lower operating costs—these are the more important benefits to the users of CRODON-plated screen plates.

***20,000 SCREEN PLATES have been CRODON-plated***



*Long-time performance records have conclusively proved their multiple advantages and substantial economies.*

**The OPEN-BACK feature is of two-fold advantage .....**

1. Widening of the back slots permits easier stock release and consequently less possibility of clogging.
2. It allows improved coverage of CRODON plate within the slots, where adequate protection is most essential.

*Cross-section of standard screen plate, showing conventional slot construction.*

*Improved OPEN-BACK design, showing enlarged discharge area and rigidity provided by small alternate bars.*

THE OPEN-BACK construction (patent pending) is designed primarily for use only with CRODON-plated screen plates and is not recommended unless in conjunction with chromium plating. It is believed that material benefits will result from the use of the new improved OPEN-BACK screen plates. We shall be pleased to exhibit samples and provide further information upon request.

CRODON
*The Chrome Plate*
TRADE MARK REG U S PAT OFF

**OTHER outstanding successful applications in the paper industry are on press rolls, suction box covers, slice lips, forming boards, drying drums and embossing rolls. These and other applications are fully described in bulletins which will be furnished on request.**

Behind every CRODON application are the resources, experience and reputation of America's oldest and largest industrial chromium plating organization. The ability to provide satisfactory performance is the consequence of years of experience, continuous improvement, high technical standards, skilled personnel and modern equipment. The established endurance and recognized utility of CRODON invite comparison with ordinary or less serviceable plating of uncertain merit. CRODON is your dependable guarantee of the most practicable and economical service available.

## Chromium Corporation of America

*Executive Offices—120 Broadway, New York*

P. O. Box 1546
Waterbury, Conn.

1760 Lakeview Road
Cleveland, Ohio

4645 West Chicago Ave.
Chicago, Ill.

# *Spendthrifts . . .*

# WITH YOUR MONEY

# *if they're over* 15 *years old!*

*The* CONSULTING ENGINEER *has a Part in the Picture*

The independent opinion of the Consulting Engineer will greatly assist us in designing and rehabilitating for you, straight, Edward & Harper type Fourdriniers; cylinder machines; wet machines; bindersboard machines and leather board machines.

WHILE your old-time paper machines may still be doing an adequate job for you, they'll soon begin to slip below full efficiency if they are fifteen or more years old, and unmodernized. Your margin of profit will be steadily cut down. Repairs will mount up. And you'll be offering an opportunity to competitors doing finer work more economically, with up-to-date machines.

Smith & Winchester engineers will gladly survey your mill, without obligation, and offer suggestions for profitably modernizing your equipment at moderate expense.

Our advice is likely to be of value to you. As a sample of our long and varied experience, we designed and built the world's three largest Fourdriniers for fine tissue and condensor papers.

Send us the word and an S & W Modernization Engineer will be assigned to help you. Remember, this puts you under no obligation.

"CARRYING THE TORCH"

Read what S & W has done for better paper making, and our new advances today. Write for your booklet.

★

# *The* SMITH & WINCHESTER

## *Manufacturing* 1828 *Company*

PLANT AND OFFICES AT SOUTH WINDHAM, CONNECTICUT

3904

The buildings in this group represent nearly a third of a Century of Progress. The growth of this Company's Plant has been due to the quality of its products and the loyalty of its Customers.

*We recommend the following types of Fourdrinier Wires for 1936:*

**The Original Lindsay's Longcrimp**

**Modified Longcrimp**

**Duo-Wear and Regular Weave**

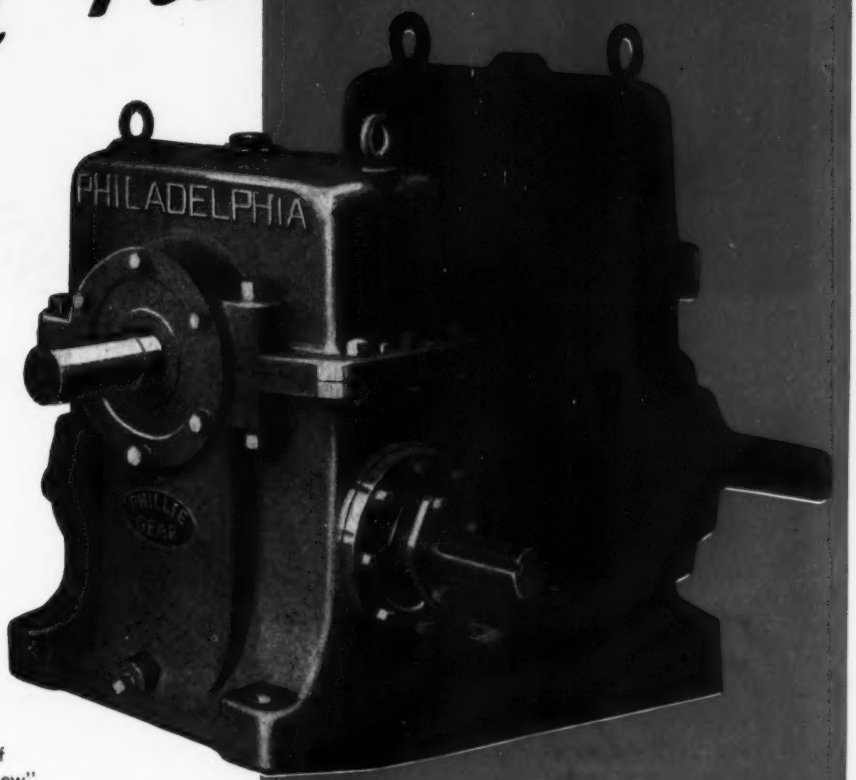
Stitched or brazed seams furnished as required.

Cylinder covers in the various meshes in Brass and Phosphor Bronze.

**THE LINDSAY WIRE WEAVING CO.**

14025 Aspinwall Ave. Cleveland, Ohio

# Here's Real Economical Power Transmission




Efficient, economical power transmission is dependent upon the merit of the design of the transmission device . . . the precision with which it is built . . . and, upon the ability of the device to maintain its "brand-new" efficiency in operation throughout the wear-and-tear of a long service life.

Philadelphia Worm Gear Speed Reducers have been carefully designed, and are painstakingly constructed from the finest, most suitable, and most rugged materials, to meet every specification for economy in operation, plus a longer, trouble-free service life.

Yes, "here's real economical power transmission" *for you* . . . and it will take but a minute of your time to ask for *proof*. Write today . . . no obligation.

PHILADELPHIA Speed Reducers

PHILADELPHIA GEAR WORKS

*Industrial Gears and Speed Reducers*

Main Office and Plant
Erie Avenue and G Street, Philadelphia, Pa.

Branch Sales and Eng. Offices
New York and Pittsburgh

PULP

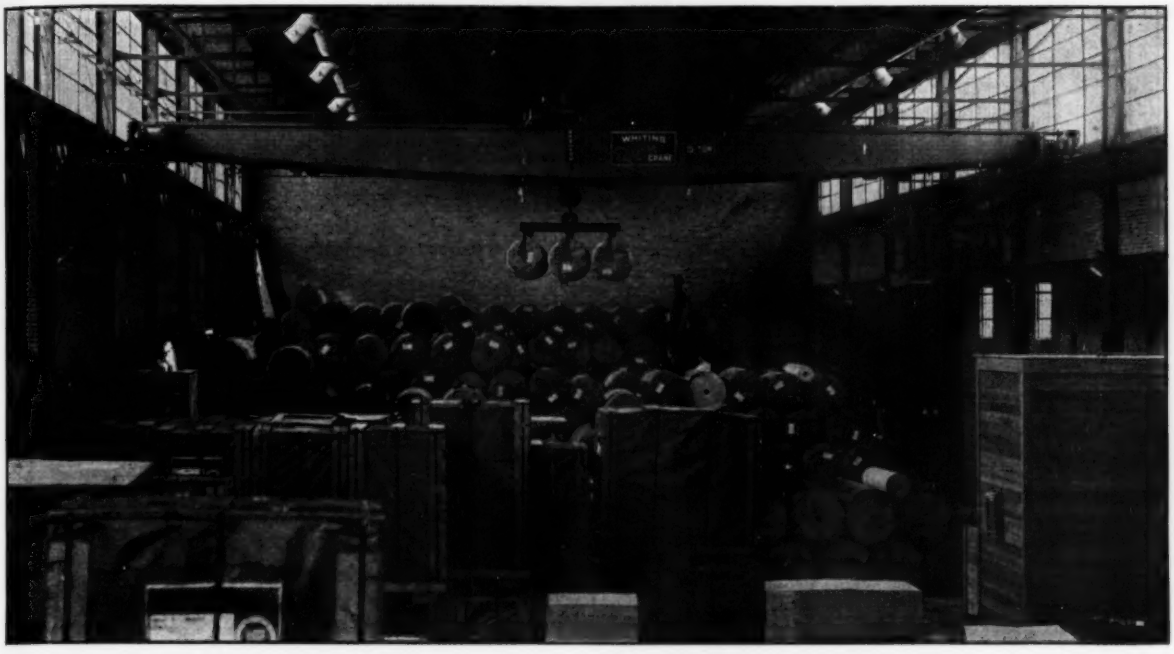
PERKINS - GOODWIN CO.

*Established 1846*

30 ROCKEFELLER PLAZA, NEW YORK

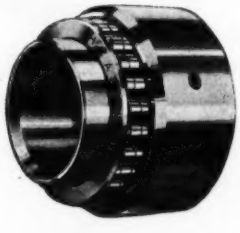
TELEPHONE . . Circle 7-6464

PAPER



# *More and More* HYATTS...
## *Less Wear and Care*

● TIGER CRANES... built by the WHITING CORPORATION, Harvey, Illinois... are typical of material handling equipment of all types available with Hyatt Roller Bearings. The same dependable Hyatt bearings as used in preparatory machines, paper machines, winders, cutters, and other mill equipment.



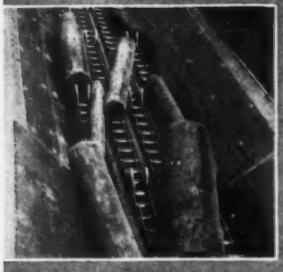
Machinery and equipment builders know that more Hyatts mean more satisfactory performance, and that every vital operating point guarded by Hyatts is free from bearing wear and care.

Because Hyatts are so correct in design—because they are made with the care and precision of a fine watch—because of their sound application engineering—Hyatt Roller Bearings play a big part in that excellence of unseen machine construction which buyers accept with utmost confidence. Hyatt Roller Bearing Company, Newark, Detroit, Chicago, Pittsburgh, San Francisco.

# HYATT
## ROLLER BEARINGS
PRODUCT OF GENERAL MOTORS

# Handle It and Drive It The LINK-BELT Way

## *for* Efficient Conveying of Materials . . . . .



No matter what material or product you handle or move, there is a Link-Belt elevator, conveyor, excavator or type of mechanical handling equipment suited for the purpose and conditions, that will give reliable low-cost service.

It may be a bucket elevator, or carrier, a belt, chain, screw or overhead trolley type conveyor, a skip hoist, a shovel, crane, dragline, a car spotter or any one of a large number of Link-Belt units.

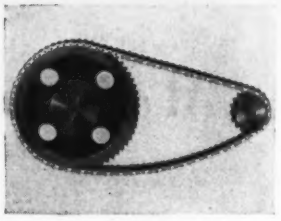
Put your handling problem up to Link-Belt experienced engineers. Let them help to determine upon the right equipment for your specific conditions.

Send for 1024-page Catalog and Engineering Handbook No. 600. It will be sent gratis to those who use or specify elevating, conveying and power transmitting equipment.

## *for* Positive Transmission of Power . . . . . .

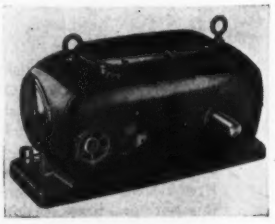
*Silverstreak Silent Chain Drives* —
For high speed power transmission Link-Belt Silverstreak silent chain drive is unequaled. It is low in first cost and requires no special attention—no upkeep expense. Send for Data Book 125 and Stock List 725.

*Silverlink Roller Chain Drives*—
For moderately high speed, light or heavy duty power transmission service—represents the ultimate in chains of this type. Send for Data Book and Stock List 1457.



*Variable Speed Transmissions*—
The Link-Belt P. I. V. (Positive Infinitely Variable) Gear is a positive, compact, chain-driven, all metal, self-lubricating, variable speed transmission. Available for horizontal and vertical mounting of the basic unit; also motorized, and with gear reduction sets. Send for Book No. 1574.

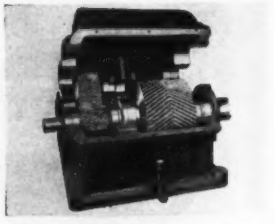
The V. R. D. (Variable Roller Drive) for fractional H.P. service. Book No. 1374.



*Speed Reducers*—
Link-Belt herringbone gear type speed reducer is a fully enclosed self-contained unit with ability to withstand heavy shock loads. Built in a variety of sizes, in single, double and triple reductions, and in a large range of ratios and horsepowers. Send for Book No. 1519.

Link-Belt worm gear reducers are made in a wide range of ratios and capacities, single and double reduction, horizontal and vertical types. Send for Book No. 1524.

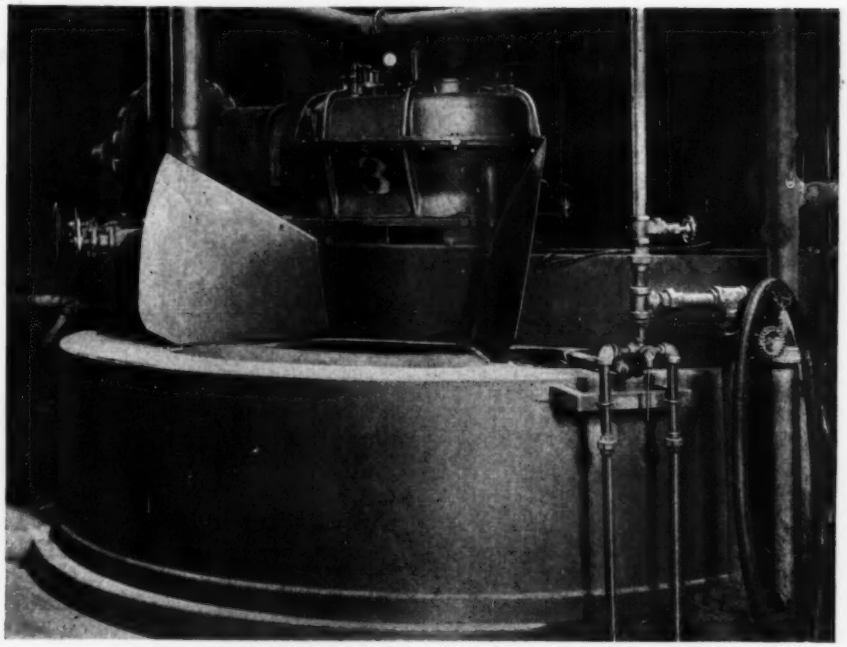
Link-Belt motorized helical gear speed reducer provides unusual compactness, simplicity and economy in first cost, with high efficiency and durability. Send for Book No. 1515.



**LINK-BELT COMPANY**

The Leading Manufacturer of Equipment for Handling Materials and Transmitting Power

CHICAGO INDIANAPOLIS PHILADELPHIA
ATLANTA SAN FRANCISCO TORONTO
Offices in Principal Cities



# The VORTEX BEATER

## The BEATER *of the hour!*

THE Vortex Beater is the beater of the hour. It is focusing industry-wide attention. Its advantages are so advanced and revolutionary that it is recognized as one of the greatest beater achievements since the invention of the Holland Beater.

It is the beater which progressive mills are turning to today . . . the beater which hyper-conservatives will come to tomorrow.

*Because*—when a beater will save 25 to 50 percent in power . . . load a ton of soft laps in 3 minutes, a ton of hard sheets in 20 minutes . . . cut beating cycle in half . . . and increase circulation speed about 7 times . . . it effects a reduction in beating costs which no mill can afford to ignore.

If the change is inevitable, *now* is the time to take action . . . and investigate. Write us for specific details.

**45 YEARS OF BEATER-BUILDING EXPERIENCE**

**VALLEY**

**IRON WORKS COMPANY**

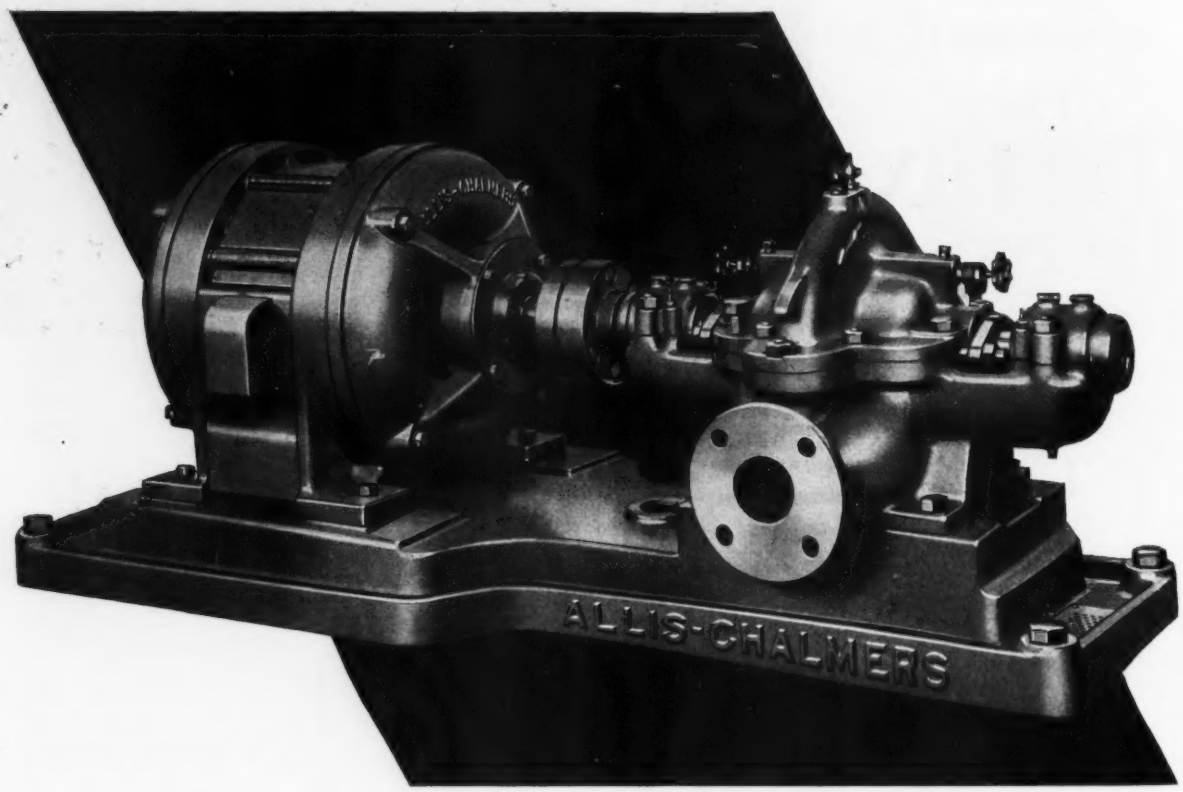
Plant: Appleton, Wisconsin

New York Office: 350 Madison Ave.

Canadian Representatives: Pulp & Paper Mill Accessories, Ltd., Montreal, Canada

# A Good Pumping Unit

## *For Average Requirements—*
## 30 to 50,000 gpm.




ALLIS-CHALMERS Centrifugal Pumping Units have a fine and sturdy appearance and they perform as well as they look. They are backed by half a century of experience in engineering and building good centrifugal pumps. You can depend on Allis-Chalmers Units.

The Type "S" unit, shown above, is one of the most widely used units for general purpose pumping. This type will handle capacities from 30 to 50,000 gallons per minute. It is an improved double-suction, split-casing, bronze-fitted, horizontal-shaft pump designed for long service and high efficiency at a reasonable cost.

Type "S" pumps are described in Bulletin 1650. Write for a copy.

**Centrifugal Pumps**

The Allis-Chalmers line consists of low, moderate, and high head single stage pumps of 1" to 72" discharge, multi-stage pumps for working pressure up to 1500 pounds, high efficiency paper stock pumps, and pumps for special applications.

**ALLIS-CHALMERS**

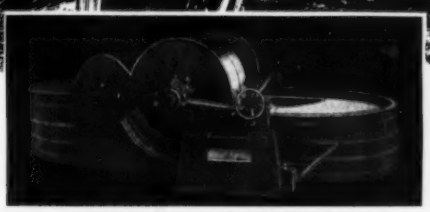
— Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin, U.S.A. —

# You are entered

You are going to see new highs in paper qualities and new lows in production costs. Mills all over the country have purchased new equipment, rejuvenated old, balanced their whole manufacture. It's a competition of mechanical equipment. The Jones organization has seen it coming and has devoted the interim of depression in developing and improving their entire line of stock preparation equipment for greater capacities with lower power costs, better quality papers and less maintenance. Yes, you are entered in the race. You can't compete successfully and use obsolete or inadequate equipment. That's why you owe it to yourself to know of the many improvements that Jones has made—improvements that will enable you to compete without handicap. May we send you full particulars?

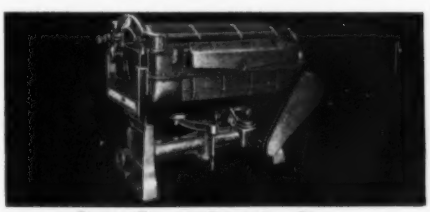
E. D. JONES & SONS COMPANY
**Pittsfield, Mass.**

**Jones**
**BUILDERS OF HIGH GRADE MACHINERY FOR PAPER MILLS**



*New Jones Multibeater*

*Jones Split Adjustable Shell Jordan*



*Jones Large Capacity Screen*

*Improved Jones Pulper*

OTHER JONES PRODUCTS: Refiners; mixing, washing, bleaching and Cooking Engines; paper stock washers; stock valves; Tanks; Chests; Dusters; Suction box covers; Teale Flexible Slice; Bandless or Banded Jordan Plugs or Beater Rolls; all types Beater and Jordan Fillings, and Laboratory equipment.

# YOU *are cordially invited . . .*

**T** APPI members attending the Convention in New York
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# PAPER TRADE JOURNAL

ESTABLISHED 1872

SIXTY-FOURTH YEAR

THE INTERNATIONAL WEEKLY OF THE PAPER AND PULP INDUSTRY AND THE PIONEER PUBLICATION IN ITS FIELD

Published Every Thursday by the LOCKWOOD TRADE JOURNAL CO., Inc.

GEO. S. MACDONALD, President — JOSEPH P. HORGAN, Secretary

Published at 34 No. Crystal St., East Stroudsburg, Pa.
Executive and Editorial Offices: 15 West 47th Street, New York
*Chicago Office:* 123 West Madison St.


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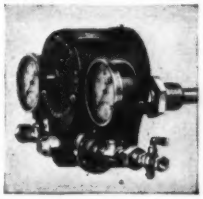

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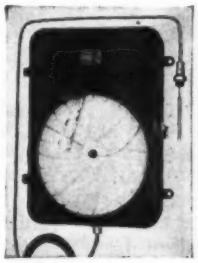

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PAPER

SIXTY-FOURTH YEAR

Established Feb. 17, 1899
Consolidated Nov. 16, 1899
with PAPER TRADE JOURNAL.

Vol. CII, No. 8 Thursday, February 20, 1936

Established Sept. 21, 1918
Consolidated Feb. 19, 1925
with PAPER TRADE JOURNAL.

# Rising Tide of Paper Production Continues

## Production of All Grades of Paper During 1935 Is Estimated At 10,307,000 Tons, or 74 Per Cent of Capacity—Output for 1936 May Exceed the 1929 Tonnage and Establish a New High Record—Four New Machines Installed During Past Year

By M. C. Dobrow, Treasurer, Writing and Cover Paper Manufacturers Association

The volume of general business as represented by the Federal Reserve Board Index of Manufacturers was 103 per cent (1923-1925=100) in December 1935, and probably 100 per cent in January 1936.

The attempt to change the automobile seasonal trend by motor shows in November, rather than in January, was a great success in developing an abnormal volume of business late in the year. In fact, the volume of automobile production in the closing months of 1935 was the highest in the industry's record for this period. This, and the consequent stimulation of the steel industry and other related industries, contributed in a great degree to the rise in the index of general business.

### Average Expected to be Maintained

It is not expected that this increase will continue to climb, but rather that the average volume of business which industry as a whole achieved in November and December of last year and January of this year will continue in the first part of 1936.

Consumption of paper, of course, depends on the general volume of business. It is, therefore, well to remember that we are now in the fourth year of recovery. From an average of 119 in 1929, the Federal Reserve Board Index fell to a low ebb of 64 for 1932. In 1933, with the beginning of the inflationary and NRA booms; it advanced to 77. In 1934 there was a slight advance to 79.

### 14 Per Cent Above 1934

The 1935 recovery has been spoken of, from time to time, as a natural recovery which took place *not* because of, but in spite of governmental experiments. The Federal Reserve Board Index for 1935 average 90 (1923-1925 =100), or 14 per cent above 1934.

### Fine Paper Tonnage Increases

Writing paper production increased from 417,859 tons in 1934 to 480,500 tons in 1935, a gain of 15 per cent. This tonnage is still 21 per cent below the 1929 peak production of 607,590 tons. Production, as compared with the practical capacity of the industry, was 59 per cent in 1934, and 68 per cent in 1935. For 1929, the industry with a somewhat smaller capacity was operating at 91 per cent.

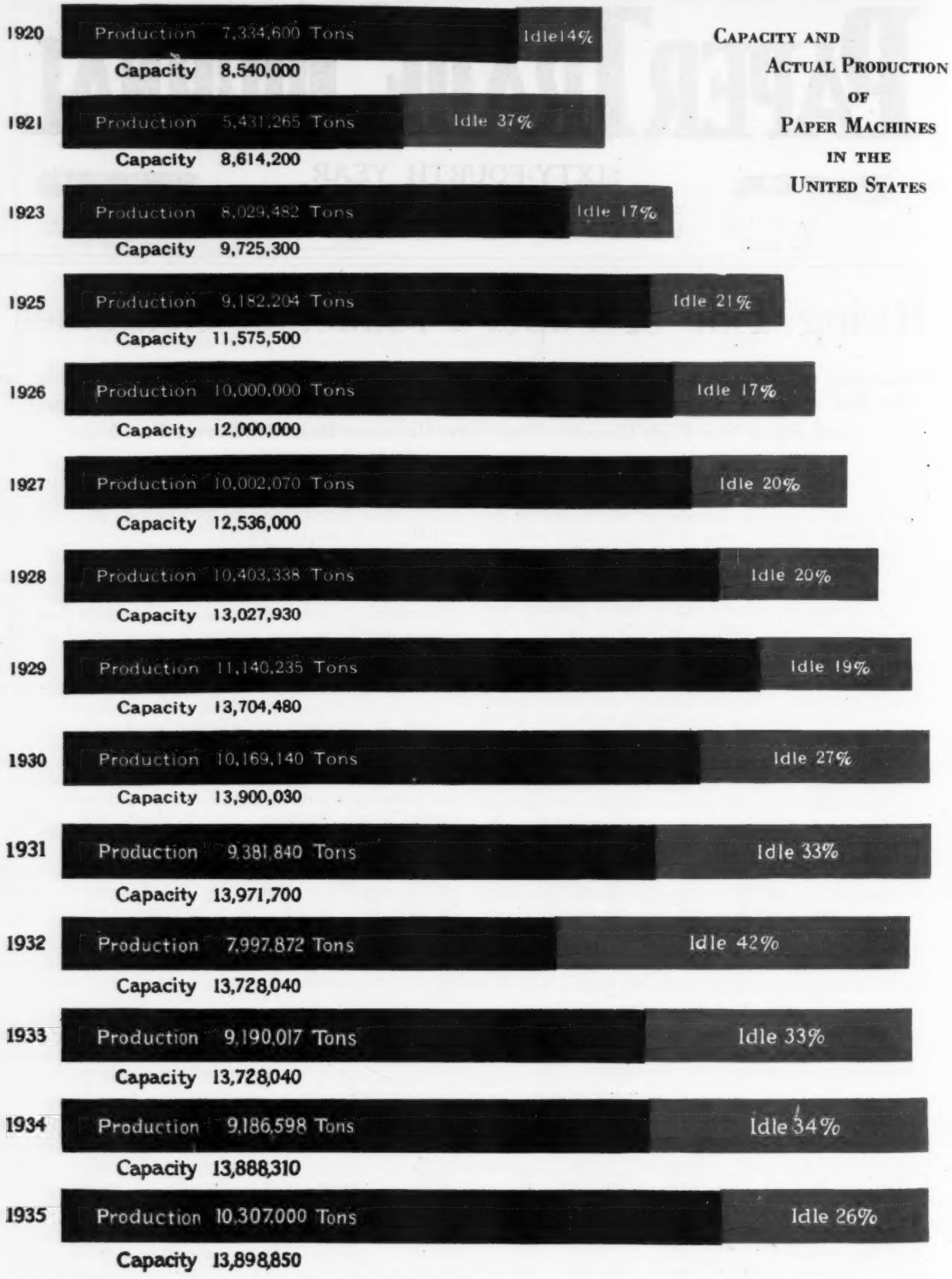
It is evident that the volume of fine paper production follows the general trend of business very closely, although, of course, it does not fall to the same depths as general business does during depressions. In this respect the paper industry is like most consumer goods industries which during depression do not fall to the same extent as durable goods industries. New buildings, new factories, and railroad extensions can be and are postponed until the days of greater confidence.

Several prominent prognosticators have again staked their reputations in forecasts that the volume of general business in the United States in 1936 will average 10 to 15 per cent above the volume of 1935.

On the basis of the more conservative forecast, production of all grades of paper in the United States may be expected to establish a new high record and exceed the 1929 production of 11,140,000 tons. This estimate of new high records in production is confined largely to the wrapping and board grades. While the consumption and volume of production of so-called cultural or printing papers should increase by an amount approximately the same as

U. S. CAPACITY AND PRODUCTION BY GRADES

| Grade | 1929 Capacity Tons | 1929 Actual Production Tons | 1929 Percent | 1934 Capacity Tons | 1934 Actual Production Tons | 1934 Percent | 1935—Estimates Capacity Tons | 1935—Estimates Production Tons | 1935—Estimates Percent |
|---|---|---|---|---|---|---|---|---|---|
| Writing Paper | 670,000 | 607,590 | 91 | 709,280 | 417,859 | 59 | 709,280 | 480,500 | 68 |
| Cover Paper | 32,000 | 28,072 | 88 | 48,670 | 17,011 | 35 | 48,670 | 20,500 | 42 |
| Book Paper | 1,700,000 | 1,497,912 | 88 | 1,790,250 | 1,055,247 | 59 | 1,790,250 | 1,194,000 | 67 |
| Wrapping Paper | 2,000,000 | 1,605,783 | 80 | 2,010,970 | 1,356,115 | 67 | 2,015,620 | 1,570,000 | 78 |
| Newsprint | 1,695,080 | 1,409,169 | 83 | 1,237,830 | 989,705 | 80 | 1,237,830 | 939,000 | 76 |
| Paperboard | 5,696,870 | 4,451,187 | 78 | 5,956,960 | 4,073,261 | 68 | 5,961,610 | 4,693,000 | 79 |
| Tissue Paper | 442,680 | 387,811 | 88 | 529,790 | 397,196 | 75 | 531,030 | 425,000 | 80 |
| Building Paper | 850,000 | 659,178 | 78 | 735,940 | 327,866 | 45 | 735,940 | 426,000 | 58 |
| All Other Paper | 617,850 | 493,533 | 80 | 868,620 | 552,338 | 64 | 868,620 | 559,000 | 64 |
| Total | 13,704,480 | 11,140,235 | 81 | 13,888,310 | 9,186,598 | 66 | 13,898,850 | 10,307,000 | 74 |




## Capacity and Actual Production of Paper Machines in the United States

*Courtesy of M. C. Dobrow, Treas., Writing and Cover Paper Mfrs. Association.*

the general volume of business, the tonnage of these grades is still likely to remain below 1929 levels.

**Machine Capacity of the Paper Industry**

The United States Census placed the capacity of all paper machines at the end of 1934 at 13,888,310 tons. With the four new machines installed in 1935 an estimate of capacity at the end of 1935 is 13,899,000 tons. These figures do not include machines in mills which are completely shut down.

Plans for other new machines and improving of old ones indicate an average capacity during 1936 of approximately 14,000,000 tons. If expectations are realized and 1936 total paper production exceeds the 1929 level of 11,140,000 tons, the industry should average over 80 per cent of machine capacity.

# Book Paper Industry Conditions Improve in 1935 Despite NRA Decision of Supreme Court

**Written Specially for the Annual Number of the PAPER TRADE JOURNAL**

The Book Paper Industry for 1935 continued to show an improvement over 1934, which in turn was an improvement over 1933. The industry as a whole, continued to feel the conditions that have existed for some years past, but the improved conditions of 1935 were most encouraging to the trade in general and resulted in a more optimistic outlook for the future.

The decision of the Supreme Court declaring the N.R.A. unconstitutional had little, if any, effect on the industry.

**No Change in Price Structure**

There has been no change in the price structure of book papers during the year, notwithstanding, costs gradually increased, but in the face of the slow recovery and the mills not having reached a normal operating schedule, brought about a condition which certainly did not warrant an increase in selling prices.

**Potential Production Capacity**

The potential production capacity of the mills manufacturing what is generally classified as "Book Paper" for the year of 1935 was approximately 1,680,000 tons. The total production for the year amounted to approximately 1,125,000 tons, which would figure a production of about 67 per cent of the normal average production when mills are operating on a normal 100 per cent basis. The latter part of the year showed some improvement in operation and production of approximately 72 per cent of capacity.

Notwithstanding the discontinuance of the operation of the N.R.A., the manufacturers generally, continued the labor conditions that were brought about by the operation of the N.R.A., that is to say, labor was continued on the basis of a forty-hour week, and there were few if any changes in the established labor conditions and wage scales.

**No New Machines Installed**

There were no new machines installed during 1935 in the Book Paper Industry, and while the operation was approximately 67 per cent of capacity, this really meant that the machine hours of operation were perhaps in the neighborhood of 75 per cent; in other words, production was slowed down and qualities improved, which necessarily meant higher costs than might have been the case had all machines been operated at "full speed."

The Coated Paper Division (which is closely allied to the Book Paper) production operated on about the same basis as the Uncoated production.

**Outlook for 1936 Promising**

The outlook for 1936 is encouraging, but conditions are so uncertain from a political standpoint that it is very difficult to predict what might happen.

It is generally believed we are in for a period of inflation which unquestionably will mean higher prices, and for that reason, contract business for 1936 is booked on the basis of the three months' price structure.

**Has Closely Followed General Business**

The volume of paper production apparently seems to have followed and closely co-ordinated with general business conditions. It is very clear that the industry has not yet obtained a position of normal profit and unquestionably will not until it nears 100 per cent operation, thereby warranting an increased price of all grades of paper, which is the hope of the manufacturers during the year of 1936.

---

## Offer Champion Paper and Fibre Stock

Public offering will be made each week by W. E. Hutton & Co. and Goldman, Sachs & Co. of New York, by means of a prospectus, of 17,500 shares of 6 per cent cumulative preferred stock and 100,000 shares of no-par common stock of the Champion Paper and Fibre Company, formerly known as the Champion Coated Paper Company.

The preferred stock is priced at $103 a share and the common at $21.50.

Of the 100,000 common shares, 78,381 have been bought by the underwriters from the company and 21,619 from a group of stockholders. The preferred issue is a new one.

The net proceeds of the sale of the securities are to be used in constructing a plant designed to produce 150 tons a day of long-fiber bleached and semi-bleached sulphate pulps by a new process developed by the company and its subsidiary, the Champion Fibre Company. By this process Southern pine can be converted, it is said, into a pulp suitable for the manufacture of high-grade paper products, replacing more expensive pulps now purchased by the company.

It is estimated that the construction program will require between $3,000,000 and $3,500,000.

Upon completion of this financing the outstanding capitalization of the company will consist of $5,335,000 of 4¾ per cent debentures due in 1950, 77,500 shares of 6 per cent cumulative preferred stock and 551,000 shares of common stock.

Net income of the company for the fiscal year ended on April 28, 1935, amounted to $981,968, or $1.26 a share on the 472,619 common shares outstanding. For the thirty-two weeks ended on December 8, 1935, net income was $743,524, or 97 cents a share. Current assets of the company on December 8 last, were reported at $5,096,532 and current liabilities at $627,693.

# Paper Stock Shows Definite Improvement In Practically All Grades

By Walter R. Hicks, of Daniel M. Hicks, Inc., New York

Business is the orderly flow of commerce, regulated by supply and demand. That may be the definition, but it is not always the practice. If you can call cross-currents, undertows, tidal waves, typhoons an orderly flow of business, 1935 gets the official brown derby, and the cut glass fly swatter, or what have you. Whether the voiding of the NRA and the AAA and the XYZs will bring about better business is a matter of conjecture and has nothing to do with the business at hand, as we are dealing with the past and not the future.

The year ended according to schedule with the clanging of bells and the crumbling of Federal regulations and the din left one in a quandary, as to whether the bells were intoning the welcome to the New Year, or giving the gong to the old year. We weigh our blessings in terms of the devaluated dollar and the balance is the difference between success and failure. In the football vernacular, the heavy scoring was done in the second half, with plenty of interference, good blocking and substantial gains. And with this background let us get down to the business of what the experts would call an analytical study of the doings of 1935.

Curves are now coming back. We are speaking, of course, from the standpoint of statistical charts and not beauty standards. Financial statements no longer blush. Business has taken heart, order books are again introduced into the daily curriculum and the good ship of commerce has set sail and responds once more to the trade winds.

With the improvements in general business, Paper Stock has reacted favorably and we can recount the progress of the market, without the heartaches, headaches and backaches of the past several years.

### Rags Most Active Grade

Of all grades of paper making material, Rags were the most active, New Cuttings showing the way, with White and Bleachable grades scoring the biggest advances. Europe was an important factor in their purchase of Rags over the year and they absorbed practically all the surplus. This kept the market pretty well cleaned up, and forced the domestic mills into a competitive position in order to cover their requirements.

As a result, White Shirt Cuttings went from 5½ cents to 7 cents per pound, f.o.b., New York. Unbleached from 6¼ cents to 8 cents per pound, White Back Blue Overalls from 3½ cents to 6 cents, Light Silesias from 3¾ cents to 5¼ cents, Light Flannelettes from 3¾ cents to 5¼ cents and all other grades showed proportionate gains.

Beside the European demand, the breaking up trade consumed important tonnages of Cuttings, which further exhausted the market. In Old Rags, Roofing was the most active and prices on Dark Cottons went from 60 cents to $1.70, with domestic Roofing advancing proportionally. Fiber grades were better and with the foreign demand for Old whites, stock moved freely at fair prices.

### Bagging Shows Substantial Gain

The market on all grades of Bagging showed substantial gains, reaching the highest peak since the good old days. Jute stocks of all kinds were in good demand, with diversification as to the consuming markets. Bagging reached limits that resulted in the paper makers throwing up their hands. It is not quite clear whether this gesture was in disgust or signified that they considered themselves victims of a "hold up." They nevertheless dropped out of the market and are standing pat in the hope that prices will ease off.

### Better Grades of Waste Paper Firmer

The better grades of Waste Paper remained firm all year with prices advancing four to six dollars toward the close.

The low grades were in a bad way all year. They moved in fair volume but prices were far from satisfactory.

Ashes to ashes,
Dust to dust,
If the Board Mills don't get it,
The City Dumps must.

That is the cry of Mixed Paper reduced to poetry. But more strictly speaking the packers are in the dumps with Mixed going to the incinerators. The price remained at one level throughout the year, which was too low to permit of profitable handling. News was in about the same position.

The situation on Magazines has presented a problem. The price has remained fairly stationary in spite of the advance of Pulp. Ordinarily the differential between Magazines and Sulphite and Soda Pulp would be closer than has existed for the past two years or more.

The present low price of Book Stock is attributed to a change in the furnish at the mills that calls for only twenty per cent Book Stock, as compared with fifty to sixty per cent in former days.

On the whole, the market showed a definite improvement in practically all grades with every indication of increasing demand with steadily advancing prices. The stage seems set for a prolonged period of good business and in ringing down the curtain on '35, let us hope that nothing will happen to ring down the curtain on the drama of business.

## January Newsprint Statistics

Production of newsprint in Canada during January, 1936, amounted to 227,955 tons and shipments to 181,403 tons, according to the Newsprint Service Bureau. Production in the United States was 79,361 tons and shipments 75,388 tons, making a total United States and Canadian newsprint production of 307,316 tons and shipments of 256.791 tons. During January, 26,348 tons of newsprint were made in Newfoundland and 171 tons in Mexico, so that the total North American production for the month amounted to 333,835 tons.

The Canadian mills produced 25,996 tons more in January, 1936, than in January, 1935, which was an increase of 13 per cent. The output in the United States was 937 tons or 1 per cent less than in January, 1935, in Newfoundland 1,664 tons or 6 per cent less, and in Mexico 1,895 tons less, making a net increase of 21,500 tons, or 7 per cent above January, 1935.

Stocks of newsprint paper at Canadian mills were reported at 76,658 tons at the end of January and at United States mills 14,194 tons, making a combined total of 90,852 tons compared with 40,327 tons on December 31, 1935.

# Kraft Paper Industry Makes Steady Progress Due to Returning Business Confidence

**By S. M. Hudson, Secretary, Kraft Paper Association**

The year 1935 for the Kraft Paper Industry was, on the whole, one of conservative progress. It was singularly free from violent changes of any kind and it may be reviewed with considerable satisfaction.

In common with other divisions of the paper industry, kraft paper felt the effects of returning business confidence and the volume of shipments increased substantially in 1935 over 1934 and exceeded slightly the greatest volume heretofore recorded in any year.

This increased volume was not occasioned by any speculative spurt of buying, but was spread over the entire twelve months' period quite evenly.

In only three weeks during the year 1935 did the volume of new orders received fall below the volume reported for the corresponding week of 1934.

Prices during the year showed little change in level, and apart from some slight weakening in the early summer months, they remained generally firm, the market being at the same level at the end of the year as at the beginning.

The marketing of our product has been a difficult problem for many years. It is believed that in 1935 some progress was made in the solution of this troublesome subject.

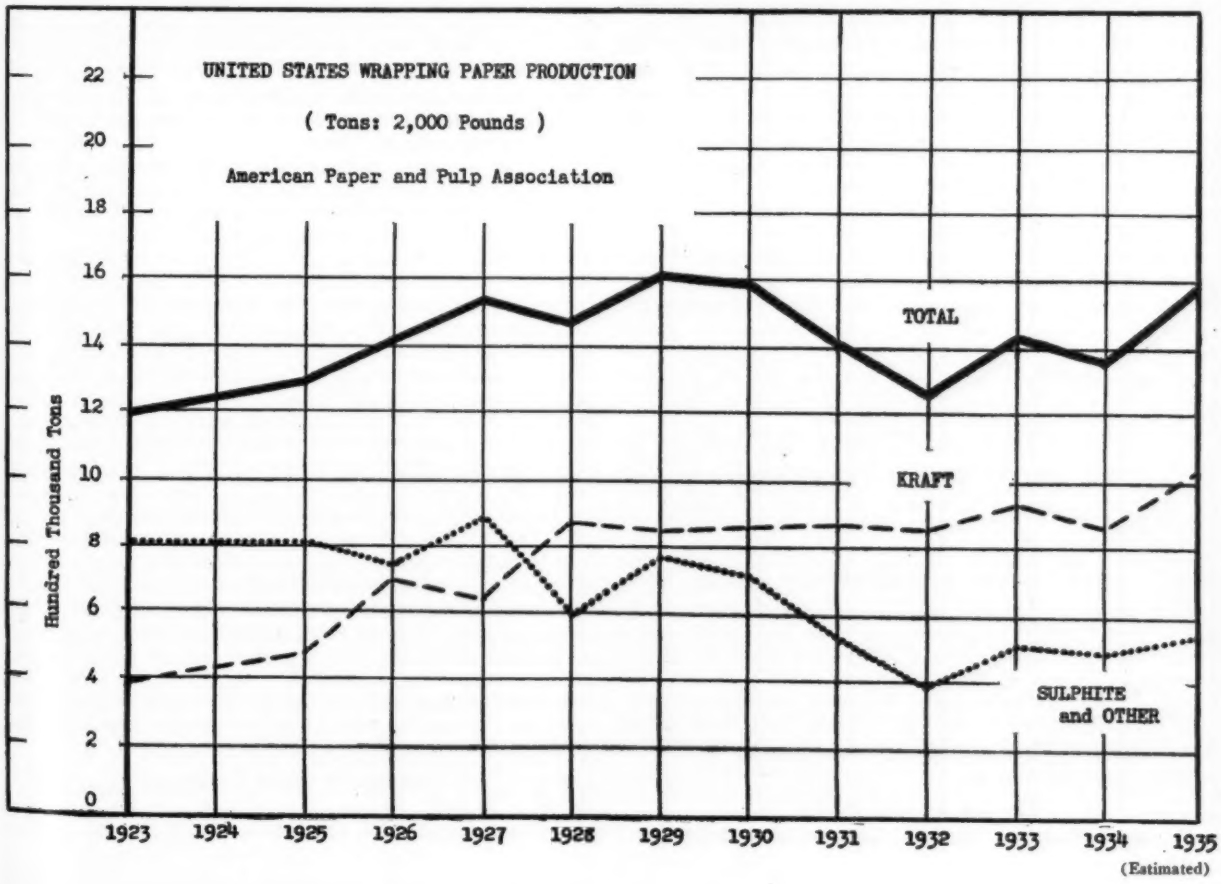
Much remains to be done, however, in the development of improved methods, and probably considerable time will still elapse before the problem can be worked out to our complete satisfaction.

The Industry has not tried any made-to-order standardized plan of distribution, but instead has settled down to a continuous study of marketing and to an educational program which will lead eventually to a solution which will be lasting as well as practicable.

Among the most important problems confronting the Industry at the beginning of 1936 is, of course, the advancing cost of manufacturing. This we face in common with all members of the Paper Industry, and it is likely this will be continually before the Industry for several years.

Another problem of a serious nature which is faced continually is the growing volume of imports of our product. During the past year the volume of imports more than doubled those in any preceding year, and a continuation at the present rate or in larger volume will certainly add greatly to the marketing problems of the Industry.

We look for a continuation of the volume of business at levels equal to or better than those attained during the year 1935, which is a fortunate prospect for an industry such as this one, where there is ample idle productive capacity to take care of a greatly increased demand.



# Pulp Industry Makes Substantial Recovery From 1932 Low Point of Depression

By O. F. Swanson, Sales Mgr., J. Andersen & Co., and the Pulp and Paper Trading Co.

In reviewing the events of 1935, it is evident that the pulp industry has experienced a substantial recovery from the 1932 low point of the depression, and still seems, in a fair way, to be making further progress. The year recently closed will, undoubtedly, be remembered for many years to come by all who are in any way connected with the wood pulp industry; firstly, because of its large production and consumption of all grades of chemical pulp and, secondly, because of its low prices on mechanical wood pulp. On the whole, however, 1935 should be considered a fairly satisfactory year, and will probably go down in wood pulp history as a record breaker in production and consumption. This opinion, being based upon preliminary and optimistic reports, is subject to change without notice, but present indications are in favor of record production and consumption when the figures of the year have been compiled.

### Kraft Pulp Particularly Strong

Among the several noteworthy and gratifying features of last year, the most outstanding of all were the brisk demand for kraft pulp, the large tonnage produced, consumed and sold, not only for deliveries this year, but for 1937 as well. With modifications, the same can be said about bleached sulphite, which has been in good demand since July 1935, and is still gaining popularity.

Most Swedish, Finnish and Norwegian Kraft Mills have disposed of their entire production for 1936, and for some time past have closed contracts for deliveries throughout 1937 and extending well into the first quarter of 1938. As a rule, such contracts provide for some protection against exchange fluctuation. These long-term contracts may infer a return of confidence in the future, and a discontinuance of the former practice of favoring "hand to mouth" buying and selling.

This latter method is apt to encourage price-cutting and cause too frequent changes in the paper mills of pulp, both of which, as a rule, are found unprofitable to buyer and seller alike, because the buyer, not always being accustomed to the varying characteristics of the different grades must spend some time and consequently, money to learn how to treat these various brands correctly in order to obtain former and satisfactory results.

If this is not accomplished quickly and without too much trouble, the seller is apt to be advised that the pulp is not suitable for the purpose it was intended, and while the buyer prefers its removal, he might be induced to use it sparingly in some other and inferior papers at a reduced price, and in order to keep peace in the family, this latter proposal is usually accepted. If not, the seller often loses a customer, but no matter what position he takes, he is the loser as far as any further business in the same grade with this particular customer is concerned. It has been found beneficial to both sellers and buyers that the quality of the grades supplied is almost identical to satisfactory brands used in the past by each individual buyer. This, of course, does not apply to specialties, but only to regular standard brands.

### Bleached Sulphite Firmer

During 1935, paper of high whiteness attracted the attention of the paper trade, and certain paper makers and some pulp manufacturers set out to supply paper and especially "high-bleached sulphite," which pulp was sold at the price of 2.90 cents per pound on dock, usual Atlantic ports. This is an increase of from $6.00 to $8.00 per short ton over the S. P. S. (Sulphite Pulp Suppliers) minimum prices on standard qualities of bleached sulphite.

Reference to the S. P. S. in Europe is a reminder that mention should be made of the excellent work which has been carried on for some time past by this Association. It is doubtful whether any other agency, interested in promoting stabilization and in effecting other improvements in the trade, could have done more for the good of the pulp industry than this particular organization.

### Some Pitfalls Ahead

In spite of this, and other activity for the benefit of the pulp and, consequently, the paper trade, together with the knowledge that the pulp industry has cleared many a hurdle during the last three years on the treacherous track to normalcy, the fact must not be overlooked that there are still some pitfalls ahead on the home-stretch and that caution is required to insure continued improvements.

He would be a bold man, indeed, who would wager that the present brisk demand for kraft pulp, or for any other grade of chemical pulp, will not diminish after the new pulp mills now under construction, together with some idle mills have been put into operation, unless, in the meantime, something unforeseen should happen which would necessitate an increase in the world's production and consumption of pulp.

Broadly speaking and notwithstanding the large tonnage of all kinds of wood pulp manufactured in the U. S. A., our paper industry is largely dependent upon a steady and substantial flow of imported wood pulp.

The quality of pulp of home origin is very satisfactory, but the tonnage available for disposal to the so-called converting mills is insufficient to cover their requirements, because it represents a comparatively small tonnage in the aggregate. It is very doubtful that a sufficient supply of spruce pulpwood would be available to enable American pulp manufacturers to increase the U. S. production of pulp to cover the requirements of the several hundred paper and boardmills which are now either wholly or partially dependent upon imported pulp for the manufacture of their products.

These mills are scattered throughout the country, and they would probably be compelled to either discontinue operation altogether, or at least to curtail production considerably if imported pulp—and at low enough prices—was not available so as to enable them to compete in their own products with the finished products of paper and boardmills producing pulp for their own requirements and in some cases have a surplus for sale. Under the circumstances, this imported pulp appears to be an absolute necessity, as far as the converting paper and boardmills are concerned.

### Influence of World Conditions

The influence of general conditions throughout the world upon production and prices of pulp became increas-

ingly evident last year. However, to what extent would probably be impossible to determine because the pulp trade covers such a vast territory and is so widely scattered that it is impossible to get a bird's eye view of the situation. It would seem that any expression on this matter would be based, more or less, on guesswork.

This brings to mind the NRA, a giant in life, who already is practically forgotten, although a few memories concerning his existence still linger as interesting topics for discussion. It has been said that the evil a man does, lives after him, but the good about him is usually interred with his bones. Perhaps, this is the case with NRA, but regardless of everything said, he must have had some good points. In any event, his intentions were sincere and he, undoubtedly, tried his very best to develop unity and create a big and happy family.

It is also possible that, after all, he even aided the pulp industry, and who knows if his doctrine was not too advanced for present minds and conditions and whether, or not, a wiser and tamer eagle might come home to roost, should conditions become more favorable for a pleasant return reception.

The breathing spell granted by the administration last year has most likely been beneficial to business in general and, although this condition is largely of a psychological nature, its influence, nevertheless, has been great enough to bring about desired results.

### Association Support Valuable

Like former years, 1935 received stout support from various associations, directly and indirectly connected with the pulp industry, and also from various trade publications both on this side and abroad. These valuable welfare agencies are covering a very wide field and are, to some extent, responsible for the improved conditions and for the general good feeling and cooperation now existing in the industry, and which has been prevalent for some time past and at present appear to have become a fixture in pulp circles.

These channels are also responsible for many other valuable contributions to the trade, and the work of these friends is never ended, for problems of the most unexpected character are constantly arising, and often without warning. The occurrences of such incidents are probably most frequent in the technical division.

Regularized production and, in a way, distribution, together with endeavors of the S. P. S. to fix minimum prices on the grades of pulp manufactured in Sweden, Norway, Finland, Germany, the Balkan States and elsewhere, had the anticipated beneficial effect in the industry and tended to diminish the practice of annoying trade tactics and other undesirable remnants of the past. If the present program is permitted to continue in effect, it should solve many of the industry's problems, create greater stability and in a general way, operate to the benefit of common interest of all concerned.

The advance in production and consumption was not confined to only the U. S. A. and Canada, but took place in other pulp producing countries as well. Judging from recent reports on the ever-expanding rayon industry, the production of rayon required about 400,000 tons of bleached sulphite last year. Its increase in consumption of this grade of pulp according to reports is between 20 per cent to 25 per cent each year. Although the paper industry is not advancing at anywhere near such a rapid pace, yet here again, progress marches on.

### Output of Chemical Pulp Increases

The reported combined production of all grades of pulp manufactured in the U. S. A. during 1935 is 4,895,000 tons, and compared with the total of 4,490,859 tons for 1934, the increase for last year is 404,141 tons, or about 8.9 per cent. The total Canadian production for 1935 is reported to be approximately 3,681,000 tons, and compared with 3,566,914 tons for 1934, the increase for last year is 114,086 tons, or about 3.2 per cent. The output of domestic groundwood for last year is estimated to be slightly below the 1934 figures and, as the tonnage imported in 1935 of this pulp is practically the same as for 1934, it is possible that our domestic newsprint paper industry is still crossing the border to the country of our northern neighbors and, if that is the case, the U. S. A. paper industry on the whole may not require as much groundwood as in the past. It is also possible that the activity in the waste paper market reflects, in a measure, on the groundwood consumption.

Figures available, at the present time, on imports of wood pulp for 1934 and 1935, are, as follows: Bleached Sulphite, 398,142 tons in 1934; 429,424 tons in 1935; Unbleached Sulphite, 675,491 tons in 1934; 693,026 tons in 1935; Kraft Pulp, 481,435 tons in 1934; 526,684 tons in 1935; Bleached Sulphate, 54,068 tons in 1934; 84,658 tons in 1935; Mechanical Pulp, 189,374 tons in 1934; 190,041 tons in 1935—a total increase in all grades combined of 125,323 tons, or about 7 per cent.

Rather heavy importations during the last quarter of 1934, of all kinds of chemical pulp combined, had the usual depressing effect on the price situation in the beginning of 1935, but in spite of this, there was no change in the price structure until March, and sales consisting of fairly important tonnages were already reported to have been consummated during the first quarter of the year and, in most instances, at regular market prices in effect for this period. During the second quarter, prices on unbleached and bleached sulphite were lowered by $4.00 per short ton on the unbleached and $5.00 per ton on the bleached. Prices on kraft pulp and groundwood were not affected at this particular time, and as the kraft pulp market was gradually strengthening, the then prevailing market price of 1.65 cents per pound, on dock, Atlantic ports, for the better grades of kraft pulp was no longer readily accepted by the sellers and as a consequence the price advanced to 1.70 cents per pound during the second quarter of the year. Groundwood was offered from $18.00 to $21.00 per short ton on dock and continued to be offered at the maximum price mentioned until the end of the year, although at that time slightly higher prices were quoted on certain popular brands.

### Demand Expands In Last Half of Year

Commencing with July, the demand for kraft pulp and bleached sulphite increased considerably, and business in general showed a marked upturn and it was evident that the gains that were registered were founded on more substantial and natural causes than had been the case at any other time for some time past.

Sentiment was improved, and renewed confidence in business circles seemed to have become a dominating factor in the forces engaged to carry the trade structure further upward, and to eradicate fear of the future. The job was so well done that contracts as previously mentioned were closed for a year and further ahead for large tonnages and, in some cases, at fixed prices for the entire periods stipulated in the contracts.

Earlier in the year, there were rumors of some business having been closed at cut prices in grades classified by the S.P.S. in the lower price brackets but the better qualities maintained minimum S.P.S. prices throughout the year.

As also mentioned earlier in this article the price-spread in the groundwood market was very narrow throughout the

entire year, and judging from reports received from Norway concerning the groundwood industry, this country was passing through the worst time ever experienced since groundwood was first produced there and the end of the trouble was not yet in sight at the close of 1935.

However, with this exception, business conditions in the pulp industry in general were fairly sound, and prospects for more normal activities in the future were anticipated at the end of the year. At that time, prices on kraft pulp had advanced to 1.75 and 1.80 per pound, on dock, on tonnage booked for both prompt and forward deliveries and prospects of prices reaching a higher level within the near future were anticipated.

### Other Grades of Chemical Pulp Steady

Prices on other grades of chemical pulp remained unchanged. Domestic and Canadian bleached soda pulp were sold at $50.00 per ton, f.o.b. delivery points, throughout the entire year. Bleached kraft pulp made the greatest progress of all grades of pulp both in regard to quality and quantity, and is now occupying a prominent position in the trade. According to reports, the imports of this grade consisted of 54,068 tons in 1934, and approximately 85,658 tons in 1935, an increase of about 58 per cent. The prices varied according to quality, all the way from 2.75 cents to 3.25 cents per pound on dock for the full bleached grades.

### Over-Production in Unbleached Sulphite

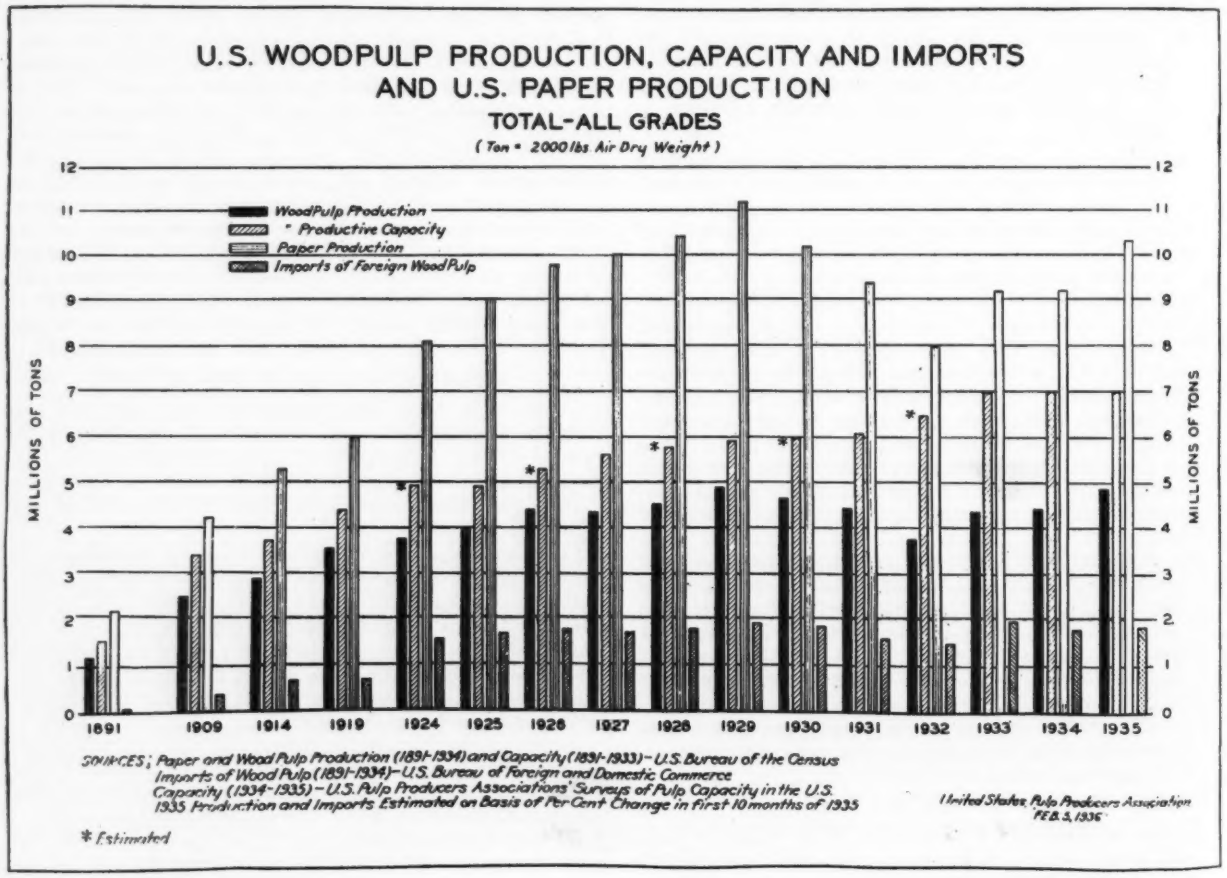
Throughout last year, there have been hopes by sellers of improved prices on all grades of pulp and, with the exception in the case of kraft pulp, these have not materialized. Unbleached sulphite is evidently still suffering from over-production, but bleached sulphite has recently shown considerable strength, and prices on this particular grade are expected to advance momentarily. Statistically, the chemical pulp situation has every appearance of being fairly sound at the present time but prevailing prices are considered inadequate, in view of the reduced capacity output, and the consequent rise in manufacturing costs.

### Range of Prices

The range of prices at the beginning of 1935 was 1.65 cents for kraft pulp; 2.05 cents to 2.15 cents for unbleached sulphite pulp; 2.75 cents to 2.85 cents for bleached sulphite pulp and, at the close of the year, the prices were: 1.75 cents to 1.80 cents for kraft pulp; 1.90 cents to 2.05 cents for unbleached sulphite; 2.50 cents to 2.90 cents for bleached sulphite; all per pound, air-dry weight, on dock, Atlantic ports. The price reduction on bleached and unbleached sulphite last year might indicate that the pulp manufacturers have realized that, if they expect to retain their business, they must cooperate in every way with the paper and board manufacturers, and to keep the prices on all grades of pulp on a low enough level to enable the so-called converting mills to at least eke out a meager living, as otherwise they might kill the goose that laid the golden egg.

### Should Keep Feet on the Ground

Even though 1936 is a Leap Year and the outlook for the year is much brighter in many respects than for some years past, it behooves the pulp suppliers to avoid the temptation of attempting any rash leaps and to bear in mind the advisability of "keeping their feet on the ground."



# Newsprint Industry's Remarkable Recovery Maintained in Canada During 1935

By C. L. Sibley, Regular Correspondent of the PAPER TRADE JOURNAL

Last year at this time I had to record that as regards production, no other single industry in Canada had staged such a remarkable comeback as the newsprint manufacturing industry. This improvement was not only maintained throughout the year 1935, but the production exceeded all previous records, even that of the banner year 1929, the output for the last-named year being surpassed by 24,489 tons. The one fly in the ointment was that this record production was unremunerative to the owners of most of the newsprint companies, owing to the fact that the contract price remained at the low level of $40 per ton, due to the lack of unanimity among newsprint producers. The seriousness of this low price level may be judged from the fact that as compared with the average during 1926-30, the price realized per ton of newsprint showed a decline of about 44 per cent, chemical pulp 34 per cent, and mechanical pulp 37 per cent. In spite of the decrease in value, however, pulp and paper still rank among the principal exports of the Dominion. Employment afforded by the increasing volume of production is also of great economic importance. Wood cutting operations, it may further be pointed out, afford employment to from 50,000 to 75,000 additional men during the winter when in many occupations, such as agriculture, construction, and navigation there is either a partial or complete cessation of work. The lumber camps not only absorb much of the floating labor, but provide work for many thousands of farmers and their horses, especially in the newer settlements where such additional revenue is most needed.

### The Price Situation

During the past year, good work in bringing the newsprint companies together in a common price policy has been done by an organization formed in the latter part of 1933, known as the Newsprint Export Association of Canada, and by its able permanent executive, Charles A. M. Vining. As a result of this work prospects were propitious for a moderate increase of $2.50 per ton for the first six months of 1936, but these prospects were shattered by the unexpected action of a United States newsprint company in accepting contracts for the present year at $41 per ton, which, according to the custom prevailing, fixes the contract price for the entire industry. The present year, therefore, starts with an increase of $1 per ton, which, it is claimed, barely, if at all, covers the increased costs of production.

Despite this drawback, there is no doubt that this industry is steadily working itself into a more healthy condition, and it is felt that in the long run all Canadian mills will be able to obtain a fair price for their production. For the immediate future hopes are centered on the spot market, which offers prospects for better prices. The long view is focussed upon the increasing demand for newsprint, not only in the American market, but also in other foreign markets and notably in South America, where the rapid growth in newspaper circulation has greatly increased the demand for newsprint. Another factor is the surprising growth of a new class of sheet which depends for circulation upon free distribution rather than on subscriptions. This is largely devoted to advertising, with news and feature fillers. Then, there is the growth of advertising circulars, which vary from one page affairs to fourteen or more pages, the larger size being put out by many of the bigger merchandising concerns.

It is felt that all these influences will result in the not distant future in all the existing mills which have hitherto lacked tonnage being able to secure all the business they can handle. Up to quite recently there has been a great scramble among the various companies to secure tonnage at any price. It is this scramble which has upset the movement for a reasonable advance in prices every time, but with increased tonnage in demand, the incentive to break from the ranks and quote cut rates is being removed.

### Comparisons of Newsprint Production

The way in which consumption of newsprint has continued to increase during the past year has surpassed all expectations. The following table supplies interesting comparisons with previous years:

| Year | Tons |
|---|---|
| 1924 | 1,350,000 |
| 1925 | 1,522,200 |
| 1926 | 1,881,700 |
| 1927 | 2,086,900 |
| 1928 | 2,381,100 |
| 1929 | 2,728,800 |
| 1930 | 2,500,000 |
| 1931 | 2,221,500 |
| 1932 | 1,907,600 |
| 1933 | 2,017,000 |
| 1934 | 2,599,292 |
| 1935 | 2,753,289 |

### The National View on Newsprint

Looked at from a national point of view the conditions in the newsprint industry are a matter of serious concern. Sir Charles Gordon, president of that nation-wide financial institution, the Bank of Montreal, put the matter briefly in his address at the recent annual meeting of the Bank, when he said:

"There has been a slight change for the better in the pulp and paper situation, inasmuch as the newsprint tonnage which the mills have been able to secure has increased considerably. Taken as a whole, however, the situation is very disappointing. Here we have one of our great natural resources in the shape of our forests being depleted at a rapid rate for the benefit of newspapers in North America and other parts of the world who desire to secure their newsprint at less than cost. The capital invested in the paper business in Canada is estimated at about $555,000,000, and we may assume that this takes only bonds and preferred stock into account, excluding the common stock, as no doubt much of it was water in the first place. It would be fair to suppose, therefore, that under normal conditions this huge investment should bring in, in the way of interest on bonds and dividends on preferred stock, some $25,000,000 per annum. Instead, however, of producing a sum approximating this, the industry shows no profit at all, the result being that few, if any, of these companies are making a contribution to the Federal income tax, as companies, and further, people who should be receiving bond interest and dividends are also making no contribution because of the non-receipt of this income. It would be a fair estimate to say that the Federal Government is losing six to seven million dollars a year on this one industry. You may ask why this should go on. It will

go on just so long as newspapers can continue to buy their material at less than cost, and our forests will go on disappearing. We are sometimes told that this is a provincial matter. It appears to me to be a Federal matter of the greatest importance."

### Fine Paper and Box Companies

Conditions among the fine paper manufacturers have been appreciably better than in the case of newsprint operators. Although they felt the effects of the depression severely they have made better progress towards recovery. Some were able to maintain dividend payments throughout the depression, and others are now resuming dividends.

The paper box manufacturers appear to have passed through the worst of their troubles. Reorganizations have been necessary, but affairs of the industry have been for the better of late and further improvement is expected.

### Much Corporate Wreckage To Be Cleared

Before the newsprint companies in Canada are on a sound basis, a considerable amount of corporate wreckage will have to be cleared away. In the past few years five of the major companies have gone into bankruptcy, and four are still in the hands of receivers. Of the balance the greater number have deferred dividend payments or are having considerable difficulty in meeting bond and interest payments. In respect to the larger companies, plans for re-organization have been the subject of much controversy during the past year. Various schemes and counter schemes have been put forward by competing interests and their respective merits considered. The general feeling is that with the improved outlook as regards tonnage the present year is likely to be one of major re-organizations, towards which substantial progress has already been made. In view of these prospective developments newsprint securities have been in demand by far-seeing speculators, and prices of the securities of most of the companies have increased substantially. A factor in helping to strengthen the outlook in the view of investors is a provision in the reciprocity agreement between Canada and the United States which went into effect on January 1st, 1935. Under this provision newsprint will continue to be admitted to the United States free of duty for the life of the agreement, namely three years.

### New Construction

There has not been much new construction during the past year. Nevertheless, there has been considerable renovation and replacement, and in view of the larger distribution of tonnage much work in the way of refitting long-idle machinery and of bringing equipment up to date is likely to be undertaken during the present year. Plans are under way for the building of a large pulp mill on the Pacific Coast, while in the East the construction of a newsprint mill of large capacity at Maniconagan, on the lower St. Lawrence, has been announced to be undertaken immediately by the Ontario Paper Company, a subsidiary of the Chicago News. This company has a newsprint plant at Thorold, Ont., but the demands of the newspaper have long outgrown the capacity of that plant. The company owns large timber limits in Quebec contigious to the point where it is proposed to build the mill.

### Newfoundland Newsprint Companies

The two newsprint companies in Newfoundland, namely, the Anglo-Newfoundland development Company and the International Power and Paper Company of Newfoundland, have both been producing newsprint at around capacity throughout the year. The former has a newsprint capacity of 1,200,000 lbs. per 24 hours, and the latter a capacity of 1,174,000 lbs. Both companies have added to their facilities during the year.

The Anglo-Newfoundland Company has installed a new wood handling system at Bishop Falls, and a new core storage, as well as new stores and machine shops at Grand Falls. During 1935 the Company cut pulpwood to the extent of 13 per cent more than in 1934 and 35 per cent more than in 1933. To give some idea of the quantity of wood cut by the Company last summer, it is estimated if it were piled four feet high, and five feet two inches wide, it would make a solid pile 260 miles long, and if the pieces were placed singly end to end it would stretch over 19,000 miles, or nearly around the world.

The International Power and Paper Company of Newfoundland has expended about $4,000,000 since 1928 in extensions and improvements, and now claims to have the largest storage space for finished newsprint in the world. It can store 65,000 tons. In January, 1935, a steel and concrete extension to the mill was completed and new tracks connected therewith. This was primarily for the housing of railway cars required for shipping newsprint to Port-aux-Basques, the Company's winter port.

According to the Company's agreement with the Newfoundland Railway, a minimum of 30,000 tons of newsprint per annum is to be shipped from this port, the agreement being for ten years, with the option of renewal. The first ship to take on a paper cargo from the new facilities at the Port was the S. S. Corner Brook, which arrived February 22 last year, and began loading a cargo assigned to the *Richmond Times-Leader*, Richmond, Va. The entire completion of the terminal was announced last December. The terminal consists of a train unloading shed, paper storage shed, carrier shed and loading pier.

### Canadian Newsprint's Long Term Outlook

Among the factors which make the long-term view in respect to the newsprint situation particularly hopeful is the marked increase in demand in markets other than those of the United States, to which the great bulk of Canada's output of newsprint has always gone. During the last year nearly 20 per cent of Canada's export of newsprint went overseas, as compared with about 72 per cent six years ago. The Newsprint Service Bureau's figures show that world production (and apparent consumption) of newsprint reached a new high mark of 7,342,000 short tons in 1934, a gain of 921,000 tons over 1933. On the other hand, consumption in the United States and Canada in 1934 was 673,000 tons below the record of 1929. The extent of the decrease in North American consumption is sometimes overlooked, due to the fact that the current production of the Canadian industry is at slightly above the 1929 level. The principal reason for this is that production has decreased in the United States to the extent of some 450,000 tons per annum since 1929. On the other hand, in 1934 the rest of the world used 690,000 tons more newsprint than in 1929.

Analyzing the latest figures as to existing world capacity for newsprint production and newsprint consumption, R. K. Martin, the secretary of the Newsprint Export Association of Canada, says: "Based on 1934 demand, there is at present a theoretical excess of 2,400,000 tons per annum. If we deduct the following three blocks of excess tonnage: Canada 1,300,000, Germany 334,000, U. S. A. 237,000, totaling 1,871,000, we are left with a world capacity of 7,873,000 against a world production in 1934 of 7,342,000 and a possible consumption for 1935 of 7,600,000 to 7,700,000.

### Canada Should Receive Chief Benefit

"In other words, allowing for the necessary small margin of surplus capacity for contingencies, it may be said that the entire newsprint capacity of the world is filled.

except for Canada, United States and Germany. Considerable doubt exists as to the efficiency of the German capacity at present prices and in any event a large part of this capacity is used for both newsprint and other grades of paper. The United States excess capacity is almost certainly higher cost than the idle capacity in Canada as a whole and moreover, is not likely to be available for overseas markets. Any substantial increase in world demand, therefore, is likely to be felt immediately in Canada.

"Canada has 40 per cent of the world's newsprint capacity, produces nearly three times as much as any other country, accounts for over two-thirds of the total world exports and now has more than 50 per cent of all idle capacity. It is only natural that, as the largest producer and particularly as the largest exporter, Canada should have been the chief sufferer, first from reduced demand 1931-1933, and now from a drastically lower price. Canada should, however, as we have seen in the preceding sections, receive the chief benefit of increasing world demand unless a sharp upward price swing brings obsolete sources into production again or promotes new construction and development such as occurred in Canada from 1926-1930."

### Newsprint Price Control Bill

One of the important developments of the past year was the adoption by the Quebec Legislature of the long-talked-of newsprint price control bill. This bill gives the Quebec government the power, upon proclamation of it, to take punitive measures against any newsprint company adopting price-cutting methods in the sale of its product. The "teeth" in the measure is the power given the government to make sharp increases in stumpage due for the cutting of pulpwood, and to make these increases against individual companies. Previous to the passage of the bill the rates ran from $2.70 per thousand board feet downward. Under the new act the government has authority to charge stumpage by the cord, the rate to be $6 per cord of 128 feet, or at the rate of $12 per thousand board feet, this being the maximum. Of course, the government may make reductions, as had been the case under the previous scale, but it will be seen that it has the power to practically put a newsprint company out of business by making its stumpage dues prohibitive in relation to those charged its competitors. The act further bars an offending company from obtaining cheap pulpwood from farmers and settlers.

Since the act was passed little has been heard of it, but the fact that it exists has doubtless had a modifying influence on the policies of the companies which it would affect.

### How Service Is Keeping

The Forest Service Department of the Federal Department of the Interior is carrying out an increasingly important work in connection with the development of scientific forestry in Canada. This includes not only field methods for the control of growth and of depletion, but also laboratory investigation for the development of the best methods for the utilization of lumber. For a number of years the forestry experimental areas under the control of the department were restricted to one locality in Quebec, namely at Petewawa. Now additional experimental areas have been obtained at Valcartier in Quebec, also in New Brunswick, Alberta, Manitoba, and British Columbia.

Of special interest to the pulp and paper industry are the investigations of technical problems pertaining to the manufacture, marketing and use of forest products carried out by the Forest Products Laboratories, and especially by the Pulp and Paper Division in Montreal, which works in close co-operation with the Canadian Pulp and Paper Association and McGill University. Among the principal activities of this division during the past year were the study and development of methods for analysis and testing of pulp and paper; fundamental researches in the properties of lignin, cellulose, pulp fibers, and wood; semi-commercial studies in pulping wood both by chemical and mechanical processes, and fundamental researches in the same fields; the standardization and calibration of instruments for testing pulp and paper; testing and analysis of samples of various woods; pulps and papers submitted by commercial firms and individuals for examination; delivery of a series of lectures dealing with the research activities of the division, and response to inquiries for information.

### Classification of Pulps

Work on the classification of pulps by selective screening was completed, and the pulp-fiber classifier devised at the division was adopted as a tentative standard instrument by the pulp and paper industry. Arrangements have been made with the industry for making this device available in Canada as soon as the necessary legal arrangements have been concluded with respect to the patent for the instrument. A method has been developed for making microphotographs of fractions of pulps classified in this manner, and the influence of fiber length on the properties of hand sheets made from selected fractions has been studied briefly.

A modification of the sheet-forming apparatus employed in the British method of pulp evaluation has been developed which permits the forming of hand sheets at consistencies such as are employed commercially on Fourdrinier machines. This method is so constituted that no loss of substance takes place, and sheets may be prepared containing size, loading, and colour in the same proportions as those used in commercial furnishes. The combined use of heat and tension in drying the sheets is possible in this method.

Methods for the determination of lignin in pulps and chips and for the analysis of sulphite cooking liquors were investigated, the investigation resulting in the selection of methods giving greater accuracy in determinations.

### Experiments in Grinding Pulpwood

In the field of mechanical pulping, the experiments in grinding wood pulp at high peripheral speeds were brought to completion. The results obtained may be summarized by the statement that it appears probable that any desired type of mechanical pulp can be ground at any peripheral speed attainable with existing types of artificial pulp-stone, and that if pulp-stones capable of operating safely at higher speeds are developed there is no reason why pulps should not be produced satisfactory under such conditions. It would appear that, other things being equal, the rate of production of a given type of mechanical pulp is directly proportional to the peripheral speed of the pulp-stone, while the energy required to produce unit quantity of such a pulp is independent of the grinding speed. Since the power which can be transmitted by a rotating shaft is directly proportional to its speed of rotation, the production of pulp from a given grinder should increase nearly in direct proportion to the peripheral speed of the pulp-stone. The commercial significance of this relationship lies in the possibility of increasing the productive capacity of existing grinders by the use of faster motors or frequency-changing devices as well as in the possibility of designing new grinder equipment with a greatly increased capacity for pulp production without a corresponding increase in capital cost. Except to the extent to which such changes increase the individual productivity of labour, little change in operating costs is to be expected in the production of a given type of pulp. It is too soon to predict to what extent the operation of pulp grinders at higher

speeds will become a commercial operation, but one commercial grinder has, as a result of the experiments just described, been operated successfully at peripheral speeds over 6,000 feet per minute and the resultant pulp converted into newsprint paper of high grade on a paper machine running at a thousand feet per minute, while several mills have under serious consideration plans to increase their production of groundwood by marked increases in grinding speeds.

### The Forests of Canada

The past year has seen the publication by the Department of the Interior of a comprehensive report on "The Forests of Canada, Their Extent, Character, Ownership, Products and Probable Future." This shows that the total forest area is now estimated at 1,254,082 square miles, 36 per cent of the total land area. Under present conditions of transportation and markets, there is estimated to be 800,783 square miles of accessible and productive forest land. On 396,739 square miles the timber is now of merchantable size, and on 404,044 square miles there is young growth which, if protected from fire, will produce merchantable stands. Of the accessible and productive forests, softwoods predominate on 473,654 square miles and hardwoods on 105,962 square miles. On 221,176 square miles the forests are mixed softwood and hardwood.

The total stand of timber in Canada is estimated to be about 287,545 million cubic feet and the accessible stand 213,251 million cubic feet, of which 176,318 million feet is softwood and 36,983 is hardwood. The accessible timber of a size suitable for sawing into lumber, amounts to 245,313 million board feet, and the smaller material which might be utilized for pulpwood, etc., 1,107,179,000 cords. The province of Quebec has the largest stand of accessible timber of merchantable size, with 54,177 million cubic feet. Ontario is next with 46,724 million cubic feet and British Columbia third, with 30,263 million cubic feet.

The state owns a total of 1,147,906 square miles of forest area, of which 126,281 square miles is dedicated to timber production, 162,052 under lease or license, and 985,856 unalienated. The privately owned forest area totals 106,177 square miles.

The various governments in Canada, Dominion and Provincial, are securing under present conditions, a direct annual revenue from the forests of about $10,915,000. This is considerably below normal on account of the reduction in the amount of timber cut and reduction also in the stumpage fees. The total expenditure is about $7,234,000, about half of which is spent on fire protection and 30 per cent on administration.

It is calculated that it is quite within the productive capacity of Canadian forests to yield 10,000 million cubic feet per annum. The total annual depletion from all causes, after allowing for an annual increment of ten cubic feet per acre on young growth and cut-over lands, is estimated to be about 4,158 million cubic feet under normal conditions of production.

### Revenue from Forests

Woods operations under average normal conditions (the present are abnormal, though steady recovery is being made) represent a capital investment of $183,000,000, provides employment on an annual basis to 91,000 men to whom $74,600,000 is paid in salaries and wages, and the value of the products (logs, pulpwood, etc.) averages $210,000,000.

Under normal conditions the production of lumber averages 4,000 million feet board measure per annum, the value of the products being around $119,700,000 a year, of which $56,570,000 is value added by manufacture. This calls for 43,457 employees in lumber production, receiving $28,513,000 in wages.

The pulp and paper industry is the most important manufacturing industry in Canada. During 1926-30 it employed 33,000 people, to whom $46,632,000 per annum was paid, and the value of its products averaged $221,013,000, which included $138,000,000 added to the value of the raw material used. In volume this pre-depression status has been regained, but prices have been so low that the value is much below that of the years mentioned.

Dealing with the exports of forest products in relation to Canada's trade, the report says: "Forest products rank next to agricultural products in the export trade of the Dominion and always provide a substantial balance of trade which, during 1926-30, amounted to over $240,000,000 annually. Though materially reduced, it is now of relatively greater importance in maintaining Canada's international credit, having in recent years comprised 26.65 per cent of the total exports, as compared with 23.6 per cent during 1926-30."

### Sustained Character of Recovery

The record of the year 1934 provided an encouraging start for 1935, for an unmistakable upturn in the industry had occurred in 1934, whereas in every previous year since the banner year of 1927, there had been decreases in the value of the production. The gross production in the manufacturing aspect of the industry in 1934 (excluding woods operations) was $152,647,756, an increase of more than 24 per cent over the figure for the previous year, and seeing that the production of newsprint in the latter part of 1935 reached the level of that in 1929, there can be no doubt of the sustained character of the recovery, or that the figures for the gross production last year, when they are completed, will again show an increase over those of the previous years.

The year 1935 started with 71 mills in Canada manufacturing pulp and 67 mills making paper, newsprint paper making up 85 per cent of the total reported tonnage of paper.

As a basis for judging the improvements throughout the pulp and paper industry in 1935, the completed figures for the previous year will prove interesting. The pulp produced in 1934 totalled 3,636,335 tons, valued at $75,726,958, as compared with 2,979,562 tons, valued at $64,114,074 in the previous year. Of the total produced 2,865,215 tons was absorbed by the mills for their own use in paper-making.

The paper mills produced 3,069,516 tons of paper and other products, valued at $122,174,178, as compared with 2,419,420 tons, valued at 97,030,429 in the previous year.

The apparent total production of pulpwood in 1934 was 5,773,970 cords, valued at $38,302,807, as compared with 4,746,383 cords, valued at $33,213,973 in the previous year.

The exports of woodpulp from Canada in 1934, amounted to 605,641 tons, valued at $25,444,844, as compared with 608,509 tons in the previous year, valued at $23,354,637. The exports of paper and paper goods were valued at $87,208,721, compared with $72,396,132 in the previous year.

The gross contribution toward a favorable trade balance resulting from the activities of the pulp and paper industry as a whole in 1934 amounted to approximately $113,520,184, being made up of the difference between the value of pulp and paper imported and exported.

The increasing output of newsprint has proved of great benefit to the hydro-electric industry, this combining with the ever-widening use of electricity to increase the output of electric power by over 11 per cent in excess of the output for 1934.

# Demand for All Grades of Paperboard In 1935 Close to All-Time High Record

**By Grafton Whiting, Statistician, National Paperboard Association**

The year 1935 opened for the Paperboard Industry with a better feeling of confidence than had prevailed, in the minds of the mill executives and also among their customers. That this feeling was justified is borne out by the fact that the production in the first six months of the year was greater by over 9 per cent than for the corresponding period in 1934.

During the first part of the year with the Paperboard Code in effect, participation in the National Paperboard Association included over 94 per cent of the industry. With the termination of the N. R. A. it was anticipated that some would withdraw, since responsibility to the Code Authority had ceased. It is interesting to note, however, that participation in our statistical exchange has been, and is today, in excess of 94 per cent.

In the last six months of the year, and particularly in the last quarter, the demand for all grades of paperboard not only exceeded the usual seasonal trend, but was beyond all forecasts for the period. This increase ran to such a volume that it brought the year's total close to the all-time high record.

As the statistical figure, from which our information is compiled, comprises such a large percentage, the statements which follow may well be considered as representing the whole industry.

### Paperboard

"Paperboard" is a term used to denote the product of a multi-cylinder or Fourdrinier paper machine, when the output is twelve points (12/1000 of an inch) or more in thickness. Calipers under twelve points are classified as paper, in contrast with the thicker grades known as "board."

The National Paperboard Association is composed of manufacturers of board, although certain grades of lighter weight are included since they are used in conjunction with paperboard.

The principal grades and the tonnage produced in 1934, were as follows:

| *Grade* | *Tons* | *Percent.* |
|---|---|---|
| Liner Boards | 729,600 | 22.4 |
| Chip for Corrugated and Solid Fiber Boxes | 267,600 | 8.2 |
| Corrugating Material | 393,400 | 12.1 |
| Sub-Total Container | 1,390,600 | 42.7 |
| Folding Boxboard | 921,600 | 28.3 |
| Set-up Boxboard | 526,700 | 16.2 |
| Other Grades (Miscellaneous) | 414,100 | 12.7 |
| Sub-Total | 1,862,400 | 57.3 |
| TOTAL | 3,253,000 | 100.0 |

Liner boards, Chip and Corrugating Material are used by the fabricators of corrugated and solid fiber shipping containers. These form the outer protection for commodities of all kinds, sent by freight, express, truck shipments and parcel post.

Folding Boxes or collapsible cartons are used to inclose a single unit or group of units such as food products, cosmetics, drugs, toilet articles, etc. They are sometimes referred to as an inner package, since shipping containers of some character must be used for transportation.

Set-up Boxes, as the term implies, are boxes set up in rigid form by pasting the box parts together and covering with plain or fancy paper. These also require an outer shipping container.

With the three major outlets for paperboard production: containers, cartons and set-up boxes, it is but logical that the demand for board would fluctuate with the activities in the three industries, and since the packaging and shipment of commodities dictate the requirements upon the box fabricators, all are dependent upon the rise or fall in general business conditions.

Beginning with 1933, there was an increase of about 17 per cent over 1932; in 1934 the volume remained the same as in 1933. During 1935 the growth was approximately 16 per cent over 1934.

The analysis of output by months during the year is given the caption of "Seasonal Variation" and is of importance in recognizing the changes in demand during the year and in scheduling mill activity.

### Seasonal Variation

Paperboard is made following buyers' specifications. These differ in size, thickness and grade to such an extent that little or no opportunity is had to manufacture for stock ahead of orders. Under these circumstances, the demand upon the mills is a composite of tonnage required by the fabricators for their current use.

There are two seasons each year of strong demand: one in anticipation of the spring and early summer business, and the other in preparation for the Holiday trade.

Chart No. 1 represents the seasonal trends over a nine-year period, 1926-1935, excluding 1933 (because of the abnormal conditions) and it will be noted that the first period, although not reaching the high point of the second, is longer sustained. This is because there is no defined way upon which the demand is focused. A late or early spring may alter the time when the public will be in the market for warmer season buying, yet due preparation must be made in advance. The second period, however, is preliminary to the holiday trade and brings the peak demand in

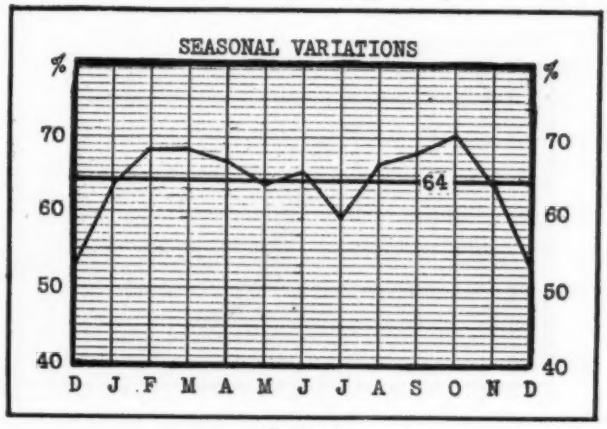



CHART 1

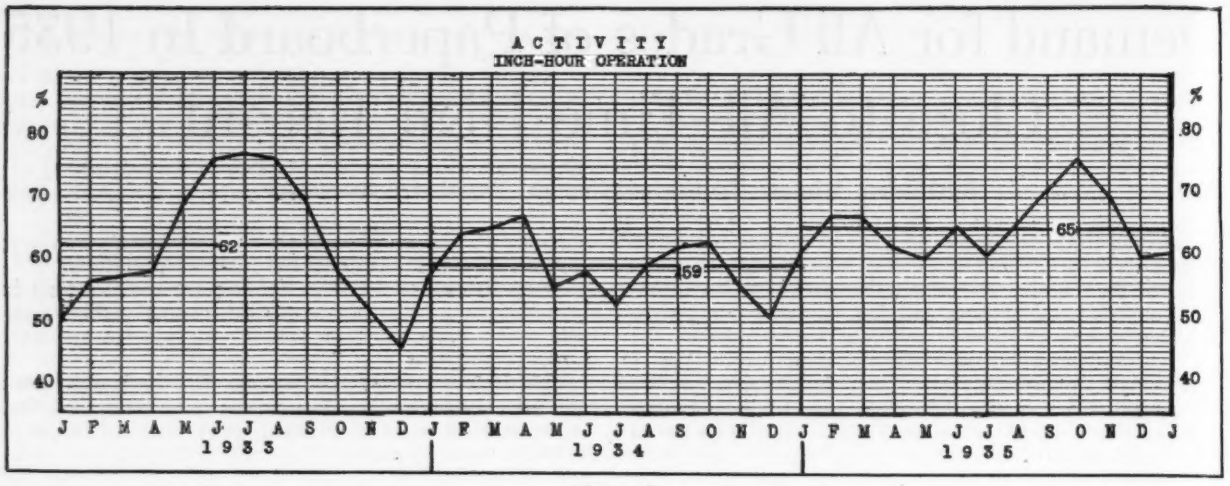



CHART 2

October, when the schedule of manufacture is well established.

**Activity**

The activity of paperboard mills is an expression of the time operated, measured in inch-hours. The width of the last dryer on each machine is multiplied by 144 hours (6 days) to give its weekly inch-hour rating. Reports received each week state in terms the number of inch hours of actual operation. By dividing the rated into the actual, the per cent of activity is obtained.

This it not an expression of capacity, since the tons produced per hour vary with different machines and with the grade and caliper of board which is made. A general average of the tons made per inch-hour compared year by year shows a gain which varies with the amount of improvement in equipment and the degree to which plant efficiency has been increased.

Chart No. 2 gives the activity by months for 1933, 1934, and 1935, and also the yearly average. Nineteen thirty-three, with its out-of-season peak from June to August, averaged 62 per cent, compared with 52 per cent in 1932—the lowest point in ten years.

Last year's standing at 65 per cent active is not exceptionally high, but this rate, together with the increase in speed, will probably show, upon completion of the industry's census, a total output second only to the record year of 1929.

**Orders and Production**

Incoming orders contrasted with production indicate the demand and supply. The situation varies in each plant, being governed by the character of its output and the needs of its customers; but by combining the figures, the average for the industry can be stated. The procedure is as follows: The tons made per hour in each plant multiplied by 144 gives a weekly rating. The orders received during the week divided by this rating give the per cent of full time running necessary to complete the tonnage represented. Likewise the tonnage produced is divided by the same rating to show the fulfillment of orders in a similar expression.

Chart No. 3 is based upon this data and where orders exceed production, the intervening area is left white and conversely, where production is in excess of orders, the area is filled in in black. In 1933 the sharp increase in orders during May and June found the mills unable to readjust their incoming raw material and volume of output quickly enough to supply the full demand. The white area illustrates this period. However, by July and August this had been accomplished, and production for the remainder of the year was in excess of orders received (black area).

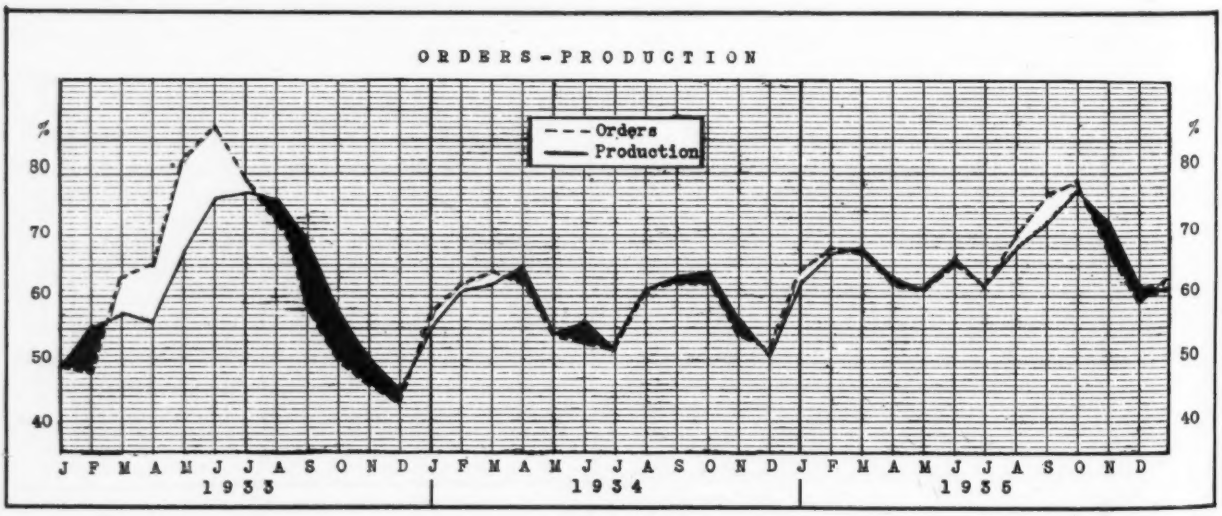



CHART 3

With the return to normal conditions and the experience gained in 1933, the following two years show but slight excess and short duration for either the white or black areas. A test of the ability of the mills to meet an unexpected demand came in the fall of 1935, and unlike 1993, the spread between demand and supply as shown by the chart did not exceed five percentage points.

### Days to Run

The term "Days to Run" is used to express the length of time necessary to complete the unfilled orders on hand if operation was continued at the average running rate. In some respects, it is similar to the Order and Production statistics except that it states in one figure the accumulation of orders at the close of each period. The tons of uncompleted orders as reported on hand are divided by the rated tonnage for 24 hours for each plant. These figures, in turn, are combined for all plants to give the industry average.

Chart No. 4 illustrates changes in the Days to Run for each month from 1933 through 1935. The average during 1933 was 6 days, with wide fluctuations due to the unusual conditions during the summer months; 1934 and 1935 show a lower average, but a more satisfactory condition, since plant operation can be better scheduled to meet demand where wide fluctuations are avoided.

The maintenance of a reasonable bank of unfilled orders is essential to economical production. As previously stated, each order is made to customers' specifications, and by having a sufficient number to select from, the trim of the machine can be more nearly filled and combination runs of like grades can be scheduled. The loss in time and material incident to changes on the machine is an important item in final costs.

### 1935 Production

A comparison of the total production during the past ten years indicates the growth in the industry.

| | | |
|---|---|---|
| 1926 | | 3,303,400 |
| 1927 | | 3,344,400 |
| 1928 | | 3,666,900 |
| 1929 | | 3,951,100 |
| 1930 | | 3,600,000 |
| 1931 | | 3,326,700 |
| 1932 | | 2,806,200 |
| 1933 | | 3,281,100 |
| 1934 | | 3,253,000 |
| 1935 | (Estimated) | 3,768,000 |

If in contrast with these figures, the general business conditions are viewed, it will be found that paperboard follows the general trend, but does not drop as low in times of severe depression nor mount as high in prosperous years. The capacity to produce is far in excess of demand as is evidenced by the average activity of about 65 per cent, based upon a six-day-week operating schedule. It is entirely practical to run a mill seven days a week and, in fact,, is the practice with some operators. If such a basis of activity were used, the 65 per cent in 1935 would be fifty-six per cent, or just over one-half of the time available.

The final figures for 1935 will not be available until the census of the industry is completed. From the records so far available the increase over 1934 appears to be between 15.5 per cent and 16 per cent. A comparison of the tonnage made by identical plants during the first six months of the year with that of the second half is as follows:

| Periods | 1928-1932 | 1934 | 1935 |
|---|---|---|---|
| 1st 6 months | 51.7% | 50.3% | 47.4% |
| 2nd 6 Months | 48.3% | 49.7% | 52.6% |

The effect of the strong demand during the fall of 1935 can be seen in the reversal of the percentage figures compared with prior years.

Stated in another way—1935 compared with 1934 shows a gain in output of 9.1 per cent during the first six months and 22.5 per cent for the second six months.

### Prices

In most industries where product is "Made to Order" irregularity in demand such as was experienced in the fall of 1935 is accompanied by marked changes in price levels. However, the principal grades of paperboard have varied but little since the middle of the year as shown below.

Prices Per Ton Delivered Chicago Area*

| 1935 | White Coated News | Single Manila Lined Chip | Chipboards Sheets | Test Liners |
|---|---|---|---|---|
| January | $57.50 | $47.50 | $40.00 | $43.50 |
| February | 57.50 | 47.50 | 40.00 | 41.00 |
| March | 57.50 | 47.50 | 40.00 | 40.00 |
| April | 57.50 | 47.50 | 37.50 | 40.00 |
| May | 55.00 | 45.00 | 35.00 | 40.00 |
| June | 55.00 | 45.00 | 35.00 | 40.00 |
| July | 55.00 | 45.00 | 35.00 | 40.00 |
| August | 55.00 | 45.00 | 35.00 | 41.50 |
| September | 55.00 | 45.00 | 35.00 | 40.00 |
| October | 57.50 | 45.00 | 35.00 | 40.00 |
| November | 57.50 | 45.00 | 35.00 | 40.00 |
| December | 57.50 | 45.00 | 35.00 | 40.00 |

* From Official Board Markets, 228 North LaSalle street, Chicago, Ill.

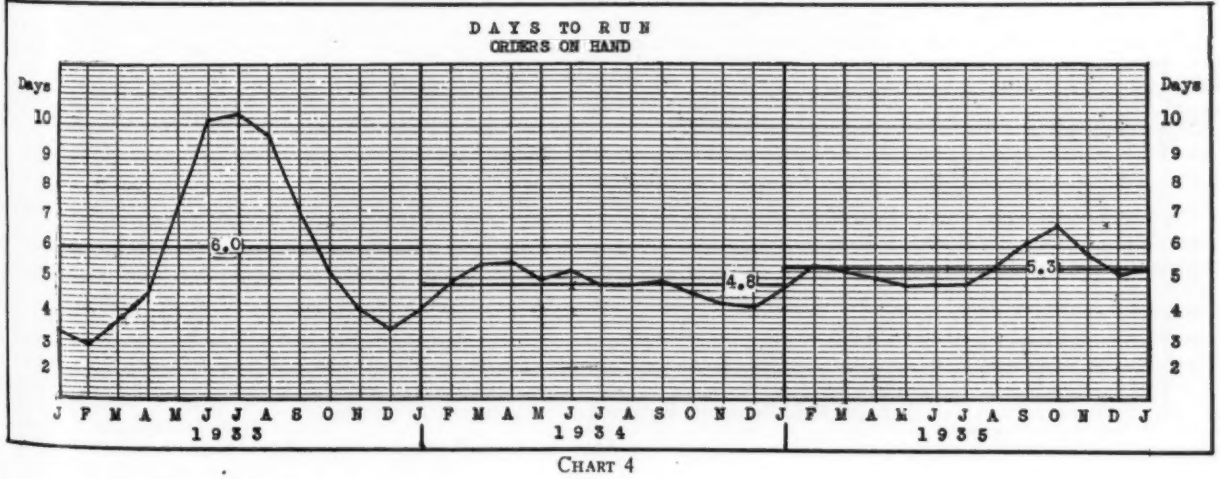



CHART 4

It is evident from the prices shown above that the increase in demand brought no improvement in sales levels. The promptness with which incoming orders were delivered gave assuranace of adequate supply to fill all demands and the keen competition which exists continued to govern the price levels.

**Prospects in 1936**

The prediction has been made that general business will be better by 10 per cent in 1936 than in the year just past. This same 10 per cent is the improvement forecast for the paperboard industry. With an estimated production in 1935 of 3,768,000 tons, a 10 per cent growth would give a total of 4,144,000 tons for 1936. If this is divided equally between the first and second halves of the year as is anticipated, the mills can look forward to a better first six months than a year ago, but a lesser comparative improvement in the fall. The average activity of 65 per cent in 1935 should advance to a point where operations would exceed by a fraction an average four days per week, with a consequent saving in costs.

If we look back a few years and add the periods when losses were incurred to the few years when profits were obtained, the average for the industry represents but a small per cent earned on the capital invested. A profitable year in 1936 is due according to the law of averages and it is needed to build up the depleted capital structure of many companies and to provide the means for modernizing plants and equipment which have of necessity been neglected through lack of funds. The fight against obsolescence is a continuous one and ground lost in one year must be made up subsequently. It is through such improvement only that the industry can maintain its position.

## Finnish Paper Industry Expands

The pulp and paper industry is well-represented among the new expansion planned by the Finnish manufacturing industry over the past year, according to recent reports from Erkki I. Kapy, American Consulate General, Helsingfors. A new paper mill is under construction at Johannes, near Viborg. The installation of machinery, ordered from Germany, is under way, and the mill is expected to be in a position to begin operation by April, 1936. The annual output will be in the neighborhood of 5,000 metric tons.

An order was recently placed by the Kymnene Company for another newsprint machine to be installed at their mill at Woikka. The new machine is of the three-reel type with a 210-inch net width and a maximum speed of 450 meters per minute. It is similar to the one installed at the same mill in July. It is expected to be in running order not later than November 15, 1936.

New plants already in operation are the new sulphite mill belonging to the Pietarsaaren Selulosa at Pietarsaari, which started operation last summer with an annual output of 35,000 tons, and new installations in the plant of the United Paper Mills, Ltd.

## Minnesota and Ontario Changes

The Minnesota and Ontario Paper Company, International Falls, Minn., announces that L. A. Furlong, heretofore manager of sales, has been made director of paper sales.

The company also announces that C. T. McMurray, who for the past four and a half years has been resident manager at the International Falls and Fort Frances mills of the company, has been transferred to the Minneapolis office as assistant director of sales. Mr. McMurray, it is stated, brings to the sales department an intimate knowledge of the company's products.

## To Sponsor Waste Material Forum

The opening session of the three-day convention of the National Association of Waste Material Dealers, Inc., which is to be held at the Hotel Astor, New York, March 16-18, inclusive, will be in the nature of a Waste Material Forum at which there will be presented what it is felt will be some of the most helpful and constructive papers bearing on waste material problems that have ever been considered at any convention representing the Waste Material Industry.

While the program for this interesting session has not been completed as yet, some of the high-lights are as follows: There will be presented at this session, by one who has spent twenty-five years with a large industrial concern, a paper entitled: "How Waste Material Dealers Can Strengthen Their Buying Connections with Industrial Concerns." Another paper is in preparation on the subject: "Can A Trade Association Be Expected to Solve Industry Problems Which are Economic In Origin?"; while a purchasing agent of a large concern consuming waste materials is to be invited to address those attending on the subject: "How Waste Material Dealers Can Strengthen Their Connections with Consumers." These are only a few of the many subjects which have been suggested to the Program Committee for incorporation in the program for this important session.

The committee, through the managing director of the association, will be glad to receive and consider as additional subjects suggestions from the membership of the association or from members of the trade at large.

The Forum session will be held on Monday, March 16, starting promptly at 2 p.m., and will be an open meeting for the entire waste material trade.

Both the convention committee, headed by Carlton B. Overton, and the banquet committee, headed by E. J. Keller, are actively at work on plans both for the business sessions and the social features which promise to make the Association's Twenty-third Annual Convention a record-breaker for attendance, interest and enjoyment.

## Sutherland Paper Has Good Prospects

One change was made in the board of directors of the Sutherland Paper Company at the annual meeting of stockholders held Monday afternoon last, at the Chamber of Commerce, Kalamazoo, Mich., and reports of a satisfactory year were given with an optimistic outlook for 1936. L. W. Sutherland, president, stated the company would continue aggressively to follow its policy of introducing new paper specialties.

The change in directors came through the election of E. A. McQuade, New York, to the board to replace Earl H. Shepherd. The other directors are L. W. Sutherland, F. W. Sutherland, O. F. Miller, W. L. Otis, F. B. Eilers, E. W. Chase, W. A. West, L. M. Crockett, Dr. L. H. S. DeWitt, W. J. Lawrence, and Charles H. Farrell.

Officers all of whom were re-elected, are L. W. Sutherland, president, O. F. Miller, R. E. Rutledge, and A. J. Young, vice-presidents; F. W. Sutherland, secretary, and W. A. West, treasurer.

## Sherman Paper Co. Elects Directors

WATERTOWN, N. Y., February 17, 1936—A meeting of stockholders of the Sherman Paper Company was held here at which directors for the year were chosen. Among the directors re-elected were: Mrs. Alice T. Sherman, J. Victor Baron, O. Palmer Barnes, John R. Wilmott, Harold W. Conde and George Olmstead.

# Big Attendance at Paper Week in New York

## American Paper and Pulp Association Holds Its Fifty-ninth Annual Convention at the Waldorf-Astoria—Many Affiliated Organizations Also Hold Successful Meetings and Discuss Numerous Topics of Importance and Timely Interest to the Industry

The Fifty-ninth Annual Meeting of the Amerian Paper and Pulp Association and affiliated organizations, which opened at the Waldorf-Astoria, New York, last Monday and continued the better part of the week, attracted an excellent attendance. Guests from abroad included S. W. Jackson, chief superintendent of mills, Australian Paper Manufacturers, Ltd., Melbourne, Australia and J. P. Heilbronn, of the J. P. Heilbronn Company, Manila, P. I.

### Election of Officers

At a meeting of the Board of Governors on Monday afternoon, the following officers were elected to serve during the ensuing term:

President, Frank J. Sensenbrenner, Kimberly-Clark Corporation, Neenah, Wis.

Vice-President, Hugh J. Chisholm, Oxford Paper Company, New York.

Vice-President, Stuart B. Copeland, Eastern Manufacturing Company, Bangor, Me.

Vice-President, Richard J. Cullen, International Paper Company, New York.

Vice-President, A. C. Goodyear, Bolagusa Paper Company, Bogalusa, La.

Vice-President, D. Clark Everest, Marathon, Paper Mills Company, Rothschild, Wis.

Vice-President, H. L. Jenkins, George O. Jenkins Company, Bridgewater, Mass.

Vice-President, John R. Miller, West Virginia Pulp and Paper Company, New York.

Vice-President, John L. Riegel, Riegel Paper Corporation, New York.

Vice-President, S. L. Willson, American Writing Paper Company, Holyoke, Mass.

Vice-President, Norman W. Wilson, Hammermill Paper Company, Erie, Pa.

Vice-President, J. D. Zellerbach, Crown Willamette Paper Company, San Francisco, Cal.

Executive Secretary, Charles W. Boyce, 122 East 42nd Street, New York.

### President Discusses Industry's Problems

Following the election of officers an open meeting was held, presided over by President F. J. Sensenbrenner, who spoke as follows: "We are assembled today in the Fifty-ninth Annual Meeting of the American Paper and Pulp Association. From this meeting we will go to group meetings for discussion of current problems. We bring to our discussions a broad experience of fifty-eight years of cooperative activities, which during the last three years have been far more intensive than ever before. In this experience we have the basis for intelligent, unemotional, competent discussion.

"Yet in spite of this experience there is uneasiness in the industry. I want to discuss this today, for I know that if it is not understood and frankly faced we will have trouble.

"Many business men are today beset with uncertainties and doubts. The trend toward Governmental control, apprehension as to the consequences of the mounting public debt, the rumblings of war, inflation, so-called radicalism and a long list of other things breed worry if not downright fear. Despite a business year that compared with its recent predecessors, was extraordinarily good, optimism is superficial; on the verge of breaking through, pessimism lies just beneath the surface. The confidence that is essential in modern business is being leached by these doubts and fears.

F. J. SENSENBRENNER, President

"Manufacturers are subject not only to these general influences but also to uncertainties peculiar to their own industries. I want to name some of those most frequently mentioned in the paper industry.

"The industry is apparently on the verge of another wave of expansion. Rumors of new mill construction are being confirmed in fact. If consumption increases do not keep pace with expansion, competition will exceed even its normal severity.

"Our marketing structure has become even more complicated than it has been in the past. Buying pressure has tended to concentrate. Opposing forces about the price structure are powerful. Costs have risen substantially and their rise continues month by month with, to me, no end in sight. A very real inflation translated into commodity prices is not yet unthinkable. But consumption

has not yet reached that sustained level that guarantees price firmness. Many manufacturers seek greater volume, and this makes the market sensitive to price pressure; and many of these manufacturers apparently give little heed to the sign posts of increasing costs.

"Many companies are financially weak; they are forced to convert materials into cash without regard to values. Their sales undercut the market; they tend to force all manufacturers to sacrifice profit.

"Differences in selling policies have a pronounced influence upon prices during periods of uncertainties. Some companies have developed efficient selling forces at considerable cost; their aim is to obtain full market price on every sale. Other companies depend upon underselling their competitors to obtain distribution; they consider the difference between their prices and the market as their selling cost. Such underselling is generally termed "chisling"; it is, rather, an outmoded marketing method that frequently creates price war.

"Unprofitable newsprint prices dominate the prices of many other grades of paper. No manufacturer finds it easy to obtain profitable prices on grades that are related to newsprint. The insignificant increases in the 1936 newsprint price was like putting salt in a wound.

"Progressive lowering of tariff rates on paper by means of so-called 'trade agreement treaties' is not calculated to encourage price firmness. Importations of certain grades have increased enormously, and they are sold in limited markets at prices which domestic manufacturers cannot meet.

"These and other causes create uneasiness because they influence prices. They cause manufacturers to think in terms of price cutting; they undermine price policies. Many hesitate between selling at prevailing market prices and cutting prices to obtain volume without regard to cost. Competitors watch each other closely in an effort to detect the first movement toward covering with volume. From this, uneasiness grows and confidence wanes.

"And just here it should not be forgotten that in many, if not most lines, firmness or stability of price is just as advantageous to the buyer or consumer as to the manufacturer, enabling him to plan his own operation without fear of wide fluctuations which prevent fair planning of business policies.

"But these are all familiar phenomena; we have experienced them many times in the past, and we have eventually overcome them by pulling together. We have learned by bitter experience that we must pull together. I venture to say that the cost to the industry of learning the lesson of cooperation has amounted to more than the profits that the industry has made in its whole history; millions upon millions of dollars in wasteful competition.

"To bring this home, let us consider our recent record. In 1932 the industry was going downhill; production was declining; payrolls, employment, wage rates were moving downward swiftly and prices were leading the way and wage cuts had to follow keeping pace. Tremendous capital, material and labor resources were dissipated in bitter price competition.

"Group activities were at their lowest ebb. Only two Divisional Associations functioned in a normal manner, two associations that had behind them more experience in cooperative activities than any other groups in the industry, and they did a remarkable job. Otherwise cooperative activities were almost nil. Antagonistic opinion existed on many issues. Trade customs which had stood the test of years of development and were accepted as fair to buyer and seller alike meant little. Even business ethics were affected. The picture of our industry in 1932 is indeed a sad one.

"Now to turn to 1934. Production was but little more than in 1932 and the burden of idle capacity was practically the same. But in spite of this the industry employed more wage-earners than ever before in its history. Its hourly wage rates were in many cases at peak levels and for the industry as a whole very little below the all-time records.

"Trade customs were observed more generally than ever before. Business ethics with few exceptions were religiously upheld. In spite of the talk of chiseling, sales below market prices were relatively few. In 1934 the industry met its obligations to its wage-earners and to its consumers, and it made progress toward meeting its investor obligations.

"What is the cause for this difference? Isn't the answer bound up in the one word "Confidence?" Of course, we had difficulties in 1934; as a matter of fact, many conditions were worse than in 1932. But instead of pulling in different directions, in plunging into blind competition, we met frequently to discuss our problems. We supported our organizations not only with money but with our time and energy. There was a surprising willingness on the part of each manufacturer to bear his share of the sacrifice for the good of the industry, instead of letting the other fellow shoulder it all. In the long history of our industry there is no comparable record of achievement.

"Uneasiness has increased since the termination of the code. Of course, there was some uneasiness during the code period; it was restlessness, rather, caused by regulation. It did not affect cooperative action. Our current brand is something else; it is threatening, I am told, the industry's willingenss to pull together.

"Few would like to see the NRA reestablished for we disagree with the principle of Government domination of cooperative activities. Yet the fact remains that we governed ourselves better then than we are doing now. One cannot refrain from questioning our ability to govern ourselves without the aid of the Soverign.

"I doubt if we can return to the exact pre-code status of business relations for new responsibilities have grown up, new ideas of business conduct have developed, and new realization of the far-reaching effects of unleashed competitive warfare have awakened public consciousness. It is unlikely, furthermore, that consumption increases can keep sufficiently ahead of the construction of production facilities, that the normal reactions of supply and demand will support a living price.

"Industry has reached the stage where it needs government, for its natural balances and checks react too slowly. The question of whether it will be self-government or an imposed government depends upon our ability now to maintain standards that permit us to meet our responsibilities. Gentlemen, we must face this issue squarely for not only are our financial and labor resources at stake, but our freedom of action, opportunity for individual initiative, and many other privileges that American business men enjoy may be threatened.

"The future of our industry lies largely in our own hands. We can move forward with profit to our workers and our inventors, or we can flounder in competitive warfare. Which will be recorded in history as our choice depends upon the extent to which we can reestablish our confidence in one another this week.

"If we deal fairly with our employees and with our customers as we have done, we will have demonstrated our right to and our ability to use self-government and we need not fear interference with that right."

### Import Committee Report

The Annual Report of the Import Committee of the American Paper Industry was presented by Chairman John R. Miller, who spoke as follows:

"Every American Paper Manufacturer has benefitted, whether he knows it or not, from the work of the Import Committee of the American Paper Industry. Most of them know something of its activities. Inasmuch as this is the twelfth anniversary of its establishment it is appropriate to review briefly its early history.

"Following a conference on February 16, 1924, a Committee of five representative manufacturers was formed to determine the policies and to maintain executive leadership over the activities of the new organization. The basic policy then laid down was that the Import Committee could do its best work as an independent organization, devoted to the single task of protecting the domestic industry against unfair foreign competition, and by being in no way involved in any other problems of the Paper Industry.

"Through this policy it was felt that the entire strength of the Paper Industry could be devoted to an effort to secure one hundred percent enforcement of existing tariff and other laws designed to prevent misclassification, undervaluation, and dumping of foreign paper. The Committee does not and never has touched raw materials.

"During all of the past twelve years the Committee has steadfastly adhered to this original policy with such success that the Committee Members today are more than ever convinced of the wisdom of the original decision.

"The Import Committee's activities are conducted by a Manager, Customs Experts, and Counsel, in accordance with the policies laid down by the Committee Members. The Manager exercises administrative control and maintains close contact with the domestic mills and their problems. Two Customs Experts devote their entire attention to the technical handling of problems before the Customs officials and in the Customs Courts. Counsel constantly advises on all legal aspects of the Committee's activities.

"While the Import Committee has closely adhered to the original policy of confining its activities to securing the enforcement of exhisting law, its resources have always been at the disposal of the Industry when problems arose involving any form of foreign competition in the American paper market, as in the case of the Tariff revision of 1929-30.

"Since its formation the Committee has so handled its task of preventing unfair foreign competition that few if any trade organizations in the United States can show such a remarkable record of valuable work accomplished. The value of the Committee to the Paper Industry can be shown in dollars and cents, in the tonnage of paper formerly imported which has been diverted to American mills. In all cases this change has been because the foreign paper previously imported could not compete with the American mills if it was properly valued and classified.

"An example of direct cash value is shown in the case of wrapping paper. When the Import Committee was formed, imports averaged 45,000 tons per year of Sulphite and Kraft combined. Undervaluation was immediately disclosed when the Import Committee began its work, with the result that the next year imports fell to 25,000 tons, and the second year to 10,000 tons. This latter figure has not been exçeeded since, until 1935 when the Reciprocal Trade Agreement with Sweden reduced the duty rate and imports jumped from the 4,000 ton total of 1934 to 12,000 tons in 1935. In the twelve years of the Import Committee's existence 400,000 tons of wrapping paper, formerly purchased abroad went to American mills, and at a basis of only $70 per ton this would mean that the Imoprt Committee turned to American mills business to a value of $28,000,000 which otherwise would have been placed abroad.

"Another typical example, is that of the results achieved for the writing paper manufacturers. In the nearly fifty grades of paper produced in that group there has been a diversion of tonnage during the past twelve years of an average of $1,000,000 a year. In a single year the United States Customs Court decided nearly one thousand cases affecting these papers, sustaining the Importing Committee's contention in practically every case.

CHARLES W. BOYCE, Secretary

"A similar method of computation of the saving to book paper and groundwood paper mills shows a diversion of tonnage valued at $1,000,000 per year for a large part of the twelve year period.

"The same results have been attained in a comparable degree in every other grade of paper made in the United States. In the twelve years of the Committee's existence upward of $50,000,000 worth of paper has been sold by United States mills, which would have been purchased abroad were it not for the Import Committee. Any paper company would pay 3 per cent commission for the sale of its product. The Import Committee has sold approximately five million dollars worth of paper a year for the American Industry at a cost of less than 1 per cent.

"This showing does not include the indirect value resulting from the prevention of losses which would have resulted from an effort to meet foreign price-cutting made possible by evasion of payment of

proper duties. To accomplish these results has meant not only the establishment of a form of industry activity never before attempted by any industry, but a constant, intensive scrutiny of all importing activities, and relentless following up of every case in which the existing tariff laws have been violated or evaded.

"During the past twelve years the number of individual cases handled by the Committee, each one requiring individual attention, has reached a total of 10,150. Over 1,700 cases are still awaiting action in the courts or before administrative officials. Of the cases decided, 6806 have resulted in decisions involving increased duties on the imported merchandise, and only 1648 cases ended with decisions in favor of the importers. Of the cases concluded over seven thousand reached the United States Customs Courts, the others being disposed of by administrative action.

"The Import Committee's presentation of these cases for the domestic industry has been so forceful that four out of five decisions rendered have been in accord with the position taken by the Committee.

"A policy of fairness to the importer who has acted in accordance with the existing laws has been so carefully maintained that many importers now ask the assistance of the Import Committee in determining proper classification of border-line papers.

"During the year ending December 31, 1935, the Import Committee handled over 500 cases. Details of these cases have been given in the periodical reports of the Committee, but it is appropriate at this time to mention some of the high spots in the year's work.

"Considerable effort has been devoted to checking the improper importations of colored poster papers. This problem has been exceedingly difficult because the policy of the industry has been to prevent the admission of such papers free of duty—under the erroneous classification of standard newsprint—without hampering the free movement of paper either white or colored, for newspaper publication. Not only have importers of this paper tried to evade payment of duty, but the sale of such special paper was at such low prices that there is now pending at Washington a complaint under the Anti-Dumping Act.

"A typical instance of the Committee's successful efforts is what has been accomplished on Bristol Board. Importers for several years past have been endeavoring to secure the admission of such board at 10 percent as cardboard. The Import Committee, however, assisted the Government in the trial of a case in which the United States Customs Court upheld the contention that the imported merchandise was dutiable as bristol at 3 cents per pound and 15 percent. This decision was upheld when the importers appealed, and several hundred separate shipments were affected. It is interesting to note that as soon as this case was decided in the courts, the Administration through the Reciprocal Trade Agreement with the Netherlands reduced the duty rate on all low priced bristols.

"A case initiated in 1931 on the undervaluation of Swedish kraft wrapping paper was carried to the higher courts, with an ultimate decision that the Swedish paper was undervalued about 1 cent per pound. Immediately after this decision in the Courts the Treasury Department decided that there was no dumping of this paper, and the State Department negotiated a Reciprocal Trade Agreement with Sweden reducing the rate of duty.

"Canadian shippers of kraft liner have been trying to find a loophole in the Canadian border for the shipment of this material at half the correct rate of duty. Shipments were made through several ports, but in every case the Customs officials imposed duty at the correct rate of 20 percent.

"These are only examples of the work done by the Import Committee in the past year. The list could be extended to cover almost every basic grade of paper. The results which have been accomplished not only in the last year, but during the entire period of the Committee's existence are such as to justify the Paper Industry's pride and confidenec in its Import Committee."

### Policies of the Association

Charles W. Boyce, Secretary, reported on the Policies of the American Paper and Pulp Association Approved by the Board of Governors of the American Paper and Pulp Association, as follows:

FUNCTIONS OF THE A. P. & P. A.

The functions of the American Paper and Pulp Association fall in three principal groups:

1. To represent the industry in contacts with Governmental agencies and with other industries in matters relating to the general welfare and interest of the industry.

2. To coordinate, through recommendation and example, the activities of the Divisional Associations in order that their service may be improved and their methods and activities may be harmonized to avoid conflict and duplication.

3. To perform general services for the industry which are not of an intra-divisional nature or which, if handled separately by the respective Divisional Associations, would involve duplication and unnecessary expense.

INDUSTRY REPRESENTATION ON GOVERNING BODIES

It is the policy of the Association to give all groups of the industry adequate representation on governing bodies. The Association's Board of Governors, Executive Committee and committees shall be elected or appointed with due regard to geographic, divisional, small and large mill, and converter and self-contained mill representation.

RELATIONSHIP WITH THE DIVISIONAL ASSOCIATIONS

The activities and functions of the American Paper and Pulp Association shall not conflict with nor duplicate the intra-divisional activities of the Divisional Associations. The Association shall not, except upon specific request, assume any function of the Divisional Associations; it shall, on the other hand, encourage and foster the adequate handling by the Divisional Associations of all matters of an intra-divisional character. For this purpose the functions of the Divisional Associations are defined as being chiefly related to the production and marketing of the products that fall within the jurisdiction of the association, including the establishment of fair and unfair trade practices, recommendations in respect to physical and quality standards and marketing practices, the collection of the statistics, and other activities of an intra-divisional nature relating to the production and marketing of the association's products.

RELATIONSHIP WITH AFFILIATED ASSOCIATIONS

The American Paper and Pulp Association when called upon shall render assistance in the development of programs and in the coordination of activities of the affiliated associations. In cooperation with them every effort shall be made to develop a coordination of administrative policies and to avoid duplication of work.

COOPERATION WITH OTHER INDUSTRIES

1. *Engaged in the Manufacture, Conversion or Distribution of Paper*: The American Paper and Pulp Association shall promote cooperation with other industries engaged in the manufacture, conversion and distribution of paper in order that courses of action may be defined

and policies formulated so that harmony may be fostered and mutual benefit derived.

2. *With Other Industries*: The American Paper and Pulp Association shall foster relationships with other industries and their representatives, particularly with the Consumers Goods Industries Committee, in order that its efforts in respect to legislation and national economic policy may be more effective.

SELF-GOVERNMENT

The American Paper and Pulp Association believes in the principles of industrial self-government under broad governmental sanction but without specific supervision or control by governmental agencies.

STATISTICS

The American Paper and Pulp Association shall collect from the Divisional Associations statistics of production and marketing which shall be combined into major groups of grades for distribution to the industry. The Association shall compile from government and other records statistics of imports and exports which shall be furnished to the industry at large. The Association shall collect directly from the members of the industry information as to weekly production, irrespective of grade, which shall be promptly reported to the industry. It shall collect directly from the members of the industry information as to wages and hours of work and the effect of these upon operation, which shall be distributed to the industry in unidentified form. It shall also, either directly or in cooperation with interested Divisional Associations, collect financial statistics periodically and report unidentified comparisons and analyses to the participating companies.

Except as specifically provided for, the American Paper and Pulp Association shall not collect the statistics of production and marketing of specific grades allocated to any Divisional Association, but it may recommend uniform procedures and scope of coverage.

LABOR

The American Paper and Pulp Association shall keep the industry informed in respect to the trends of wages, employment, working hours and other related information. It shall make periodic surveys of wage rates which shall be reported to the participating companies. It shall encourage and foster harmonious relationship between labor and management.

TARIFF

1. *Paper*: In view of recognized differences in production conditions and costs between domestic and foreign mills and the known excess of production capacity over consumption requirements of all kinds of paper in the world, the American Paper and Pulp Association stands for adequate tariff protection upon all grades of paper and paper products and to this end shall present the needs of the industry to the proper governmental agencies as occasion requires.

2. *Papermaking Materials*: The American Paper and Pulp Association shall take no stand in respect to the tariff upon papermaking materials except upon special authorization by the Board of Governors. The Association shall, however, keep the industry informed as to proposed changes in the tariff status of such materials.

STREAM IMPROVEMENT

As occasion arises the American Paper and Pulp Association shall encourage the development of regulatory stream improvement legislation rather than legislation which would create unreasonable hardships upon manufacturers of paper and pulp or that would force discontinuance of operation.

FORESTRY

Realizing the importance of an adequate supply of basic raw materials, the American Paper and Pulp Association shall support reasonable forest legislation and the reasonable expenditure of Federal and State funds for the purposes of fire protection.

RESEARCH

The American Paper and Pulp Association shall foster the development of institutional research and it shall give to research institutions advice and assistance in the coordination of research programs in order that duplication of effort may be avoided.

SERVICE ACTIVITIES

In so far as possible the American Paper and Pulp Association shall conduct its special services upon a self-sustaining, subscription basis, and it shall not expend funds from its general budget except in the initiation of such services. General services that are of value to all manufacturers shall be financed by the Association as directed by its governing bodies.

### General Grading Committee Report

Ernst Mahler, Chairman, presented the report of the Central Grading Committee, and said in part:

"In order that the problem be viewed in its entirety, it is undoubtedly wise to list some of the more important benefits to be achieved through a complete grading program:

"First of all, the attainment of an intelligible and workable marketing structure is utterly dependent upon proper grading. Trade customs and practices, inter-divisional classification problems, or any of the other functions of a marketing structure will remain hollow ineffectualities unless the products involved are properly defined. The increasing costs of business administration coupled with the narrow margins of profit demand that a more intelligent price structure be attained, and this is only possible through grading.

"Second: Whether it likes it or not, the paper and pulp industry is facing a new era in the selling of its product. If it does not respond immediately to the trend of the times, the industry will find itself trying to meet the costly specifications and instruments sponsored by its customers. The instrumentation phase of the grading program is, therefore, a protective measure.

"Third: The complex grade structure now in existence is costly and is depriving the industry, both individually and collectively, of many dollars in potential profits. As a concrete illustration, witness the achievements of the division discussed above.

"Fourth: Through grading work, the study of paper properties and the development of instruments, the industry is gaining fundamental knowledge about its product. This knowledge should lend itself to a more uniformly controlled product and to a better understanding of the manifold problems that everyone of us possesses as manufacturer of pulp or paper.

"Fifth: Certain mills are attempting in scattered and independent fashion, to develop testing instruments and means of control. They are duplicating each other's work and their individual efforts are less effective and much more costly than a cooperative, general program would be.

"In addition to the foregoing, it should be pointed out that there are numerous instruments on the market for measuring certain properties. For example, there are more than eleven instruments for the measurement of color, more than five for porosity, at least six for tensile, and five for fold. Do these all measure the same thing? Is one better than the others? Which should be used for light

paper and which for board? Which is best for control purposes and which is best for grading purposes? Do they measure the properties that they are supposed to measure? The information gained from this program will help to answer these questions and will serve as a guide in the purchasing of more accurate instruments by the individual mills.

"In conclusion, let me say that the instrumentation program is one of the most vital and compelling phases of this work. The question of continuing or discontinuing the program is being presented for consideration this week. The cost of carrying on the work is infinitely limited when viewed in the light of its importance. The amount of money necessary to support the work would be covered by an assessment of *three cents* on every *one thousand dollars of sales.* This is a contribution of merely *thirty dollars* for every *million dollars* of paper sold by the industry, a sum so comparatively insignificant in terms of the everlasting benefits, that it hardly seems necessary to make this extended plea. Once specifications are set by the consumers, the industry will soon find the costs mounting to hundreds of dollars per daily sales instead of the few dollars necessary to maintain this constructive work."

### Manufacturer-Merchant Relations

Harold L. Zellerbach, president of the National Paper Trade Association, discussed manufacturer-merchant relations. He said, in part, as follows:

"To my mind, the cardinal principle of mill and merchant relationship is one of mutuality of interest and the primary interests of both groups are to render the service to the community for which they are organized and to make a fair profit. All the other 99 purposes that might follow must, of necessity, fit in with this first principle, and in this relationship, if both groups do render the service and make money, their relationship immediately becomes harmonious and there is a very happy family.

"This mill and merchant relationship can be helped very materially by having mill salesmen spread proper propaganda in the local trading areas for the support of those trade customs and trade practices which have the support of both groups as those which will serve their division in this paper industry the best. I say this because there are hundreds of paper merchants who never come to meetings, who do not contact those of us who are attending this meeting, and see the value of the work that these meetings perform.

"It is to the absent ones that we must carry this message so that they will carry out in the spirit and the letter those things which make our "cash registers ring" and so, with this splendid example that has been set in a number of these groups, why not let us pledge ourselves that we will give our best efforts, that we will give the necessary time to the end of a Utopia in paper mill and paper merchant relationships which will bring us to that promised land of always a splendid service rendered to the public and a satisfactory *net profit* for both groups at the end of each and every fiscal year."

### Manufacturer-Converter Relationship

In the absence of Charles Dennison through illness, A. E. Sawyer, of the Dennison organization, discussed manufacturer-converter relationship. He said:

"I am making no pretense of giving Mr. Dennison's address in the very short time that I have had the opportunity to prepare for this unexpected task. I have noted down what I believe would have been the principal elements of the talk. Mr. Dennison would have developed this afternoon some intimate contacts with many phases of industrial problems, both in this country, in Europe and in the Far East. Mr. Dennison has developed a great belief in the importance of industry-wide cooperation, particularly as regards the various elements of the paper industry.

"I am sure Mr. Dennison would have dealt at some length on cooperation for the development of markets for paper and paper products and the mutual work between user and the converter in the widening of those markets and a better understanding of the uses of paper.

"Then again he would have a developed a field which is of great interest to him, one in which he believes a great deal, viz., statistical information that gives a more profound understanding and knowledge of just where we stand in the economic structure.

"One point, I am sure, in closing, he would have stressed the very great importance of modesty in the development of a plan. We have had in the past two years examples of the wastefulness of undertaking too much at one time. Embarking on any industry-wide problem of cooperation between converter and producer, it is necessary to start on a small scale, to keep at it continuously and be ready for the emergencies which will force us to act together as an industry-wide unit in facing the many problems that lie ahead of us in the next few years."

### Report of Trade Customs Committee

J. D. Zellerbach, chairman, presented the report of the Trade Customs Committee. He said:

"The Trade Customs Committee has no formal report to make, principally because of differences of opinion between the manufacturers and the National Paper Trade Association over question of trade customs. We on the Pacific Coast have had this same problem. We have been trying an experiment and so far have just succeeded in standardizing trade customs for the Sulphite Division and Kraft Division of the industry. We are hoping that if this works out successfully we will be able to enlarge on these plans and perhaps bring in other grades of the Pacific Coast under similar standard trade customs.

"So far as the national plan is concerned, I think that if anything is to be accomplished that we should have a committee which will function actively and which should include a representative of each one of the divisions who is thoroughly familiar with the trade customs within his division and that this committee should be composed of men who are available in this part of the country for meeting at pretty regular intervals.

"If they will hold such regular meetings it may be possible to take the whole set of trade customs now in vogue in all divisions and agree on some few standard trade customs as a beginning, then let each division have its own private trade customs on those matters which cannot be agreed on generally.

"That would be a start and from that point the work might be expanded so that eventually we would have customs reasonably standardized. Because of diversity of products and diversity of uses, I am very doubtful whether we will ever succeed in getting one set of trade customs applicable to the industry as a whole."

### Comparative Reporting Service Report

D. C. Everest, of the Marathon Paper Mills Company, presented the report of the Comparative Reporting Service, and said:

"This Service was approved by the American Paper and Pulp Association's executive committee, July 12, 1935. Conferences were held by Messrs. Ware and Hagenauer with a considerable number of mills in the Lake States and East to outline the items on which information was

desired. The first preliminary Comparative Statement was gotten out in August covering the Conversion Cost per Hour of Operating 50 Paper Machines. Comparative Statements have since been prepared and distributed to participating companies for the months of October and November covering: (a) Paper Machine Hour Conversion Costs, (b) Paper Mill Furnish Efficiencies per cent of waste, losses, (c) Steam Plant Costs per 1,000 pounds, (d) Steam Plant Efficiencies, (e) Sulphite Pulp Conversion Costs, (f) Groundwood Pulp Conversion Costs and (g) Soda Pulp Conversion Costs.

"The reports show growth in number of participating mills as the Service becomes more widely known. In October, reports were received covering over 70 paper machines, while in November more than 80 machine reports were received. The December statements are now in the course of preparation and it is anticipated that these will show a further increase in the reports.

"The growth of the Service indicates the desire of the mills to increase efficiencies and reduce costs and in this effort to obtain comparative data not previously available.

"The causes of variances in operating efficiencies and costs are not the same in all cases as indicated by the comparisons. It is in locating the cost or other items which places a machine or operation out of line with competitors which makes comparisons valuable.

"The Service is available for any paper and pulp company at $25 per month for any or all of the reports in which it participates."

#### Report of Committee on Public Affairs

Stuart B. Copeland, chairman of the Committee on Public Affairs, spoke, in part, as follows:

"The result of the first year's work was so definite and so valuable that the Finance Committee, for the present year, has assigned to the work of the Committee part of the time of a new member of the Association's staff. Every member of the staff of both the Association and of the Import Committee co-operates with this Committee to the fullest extent.

"The experiment has proven successful—abundantly so. The Committee is working closely and in harmony with many other nation-wide industries. Its contacts with these industries, both directly and through the well-known Consumers Goods Industries Committee, and with legislative and administrative departments, have been made upon a basis of factual presentations only.

"The Committee functions for the benefit of the industry—and every member mill in it—but the work which the Committee is doing will fall short of proper results unless we have the active support and assistance of every member of the industry. Some of you functioned splendidly when we called on you to oppose a loan by the RFC for the construction of a new kraft mill, but many of the members did nothing—even in that vitally important matter.

"The Committee wishes to state with all possible earnestness that no mill and no Divisional Association can do what the entire membership of the industry can do when acting together. Just because the immediate and direct effect of some pending bill on your own mill is not at once apparent is no adequate reason for failure to co-operate with the Committee.

"No scare bulletins to annoy and alarm you are issued. All bills affecting the industry come immediately to the Committee's attention. It gives them prompt and careful consideration. If any mill or any Divisional wishes information with respect to any bill pending in either branch of the Congress, that information will be immediately furnished. Many mills and several of the Divisions call on the Committee frequently to keep them posted, which it is glad to do. On the other hand, all too many mills and Divisional Associations and Divisional Secretaries are apt to ignore requests for help to help them. Maybe time will cure this in part—but even time has no cure for the problem unless we have the prompt and open support of the industry.

"Our industry has a capital investment of two billion dollars, with a payroll for mill workers alone of $150,000,000 a year. Our mills are in 38 States, the number per State ranging all the way from one in some States to 64 in Massachusetts and 79 in New York. These mills are in nearly 200 Congressional Districts. With its allied, affiliated and dependent industries, our industry is among the ten largest in the United States. If we speak as a united industry we will be heard. To enable it to do this your Committee was created. It needs your help and it will welcome your suggestions."

#### American Pulpwood Association Report

Howard Beatty, on behalf of the American Pulpwood Association, said:

"This group now has 122 members in 23 states and they represent more than 50 per cent of the pulpwood produced in the country. The association was organized because of the NRA Code and because the pulpwood men did not want to be tied in with the lumber industry.

"There continues today the thought that the association should be maintained, for the conflict with the lumber industry continues to exist and rather than be absorbed into that industry it would be better for the pulpwood end of the paper industry to continue its own entity. The cost of the association is less than $10,000 a year."

### Paper Salesmen's Association

The Salesmen's Association of the Paper Industry once more played a prominent part in the paper convention. The Annual Meeting was held in the Carpenter White Room of the Waldorf-Astoria, when the following officers were elected for the forthcoming term:

President, R. C. Johnson, Northwest Paper Company, Chicago.

Vice-President of Eastern Division, E. R. Lyman, Missisquoi Corporation, New York.

Vice-President of Western Division, J. T. Burruss, Albemarle Paper Manufacturing Company, New York.

Secretary, Dr. E. O. Merchant, 122 East 42 Street, New York.

The address of the retiring president, Creighton W. Whiting, follows:

"Fellow members of the Salesmen's Association:—It is a great pleasure to get together like this once every year, and I only wish it were possible for all members to be present. We would then have a real crowd, for our numbers have now reached two hundred, and we're still growing.

"During the year two well-beloved members have passed away. Karl Runcie of the Champion Coated Paper Company, and Arthur Mertens of the Kalamazoo Vegetable Parchment Company. Both were men of a high type, who are missed by all who knew them.

"Several members have changed from the mill end of the industry, and our sincere best wishes go with them in their new fields of endeavor.

"The increase in membership is due to the good work of the Committee, of which George K. Gibson is Chair-

man. He has been ably assisted by the Vice-Chairman, R. R. Cook in the Mid-West and J. K. Hutchinson, Jr. in the East. Mr. Hutchinson was responsible for the master-stroke of the year when eleven new members joined at one meeting here in New York.

"A year ago we were corresponding with a new group, of over fifty mill representatives, on the Pacific Coast. They were invited to affiliate with us and the written invitation was repeated on visits to the Coast by the persuasive Thomas F. Donoghue, and our energetic former president, Harold R. Knott. It was decided, however, that the matter should be deferred until they were a little better organized. The group has now increased to about seventy-five and I am pleased to report that a recent letter stated that the officers were in favor of joining with us and would use their best efforts to sell their entire membership on the plan.

"Early in the year the attention of our executives was called to the necessity of clarifying, simplifying and standardizing the trade customs and practices that now vary so widely among the different groups of paper manufacturers. As a result of our close contact with customers, we know that the present complexity and lack of uniformity already cause misunderstandings that may eventually wreck all the constructive work that has been done to bring about stability. Therefore, we again urge the A. P. & P. A. to act promptly in this vital matter.

"The selection of Dr. E. O. Merchant as secretary and bulletin editor was one of the wisest choices ever made by this Association. As secretary he has performed all duties faithfully and as Editor he has issued every single week a bulletin giving in a nutshell essential statistics of our own industry and a concise summary of the general business forecasts by leading economists. These are the best bulletins of the kind issued to any group of paper men, and are worth many times the amount of the annual dues.

"The bulletins include accounts of the weekly luncheon meetings in New York and Chicago. These meetings differ:—In New York the members frequently have outside speakers, while in Chicago the boys generally prefer to hear themselves talk. Anyone attending the meetings in either center is sure to gather useful information and benefit considerably from the exchange of ideas. Members from other places are cordially invited to drop in at these meetings whenever in New York or Chicago. Some do this already, and it is hoped that the custom will become more general.

"From small beginnings, the golf outings both east and west have grown to affairs of considerable size. This past year they have been particularly well attended and successful in every way. The Annual fall outing in connection with the Chicago meeting of the National Paper Trade Association was attended by over 150, making it one of the great sporting events of the paper industry.

"Those engaged in the paper business have needed the relaxation that comes from such outings, for the year has been critical and trying, full of uncertainty and strange happenings. For instance, a new paper mill in Arkansas is being built with government funds supplied by the Reconstruction Finance Corporation, which was intended only to lend temporary assistance to established business concerns.

"While we were all anxiously awaiting the next move of the N.R.A., the Blue Eagle was suddenly knocked from his perch by the Supreme Court. Chaos was predicted by high administration officials. In such a crisis it was realized that the attitude and influence of salesmen would be of the utmost importance. The A. P. & P. A. turned promptly to this organized group for cooperation. This cooperation was given and instead of getting worse, conditions have gradually improved. There is still plenty of uncertainty regarding governmental acts and policies, but the Supreme Court decisions have restored confidence and it is evident that if allowed freedom of action, the Paper Industry can solve its own problems.

"One thing the industry should continue is the open price filing plan. This works in the interest of fair play and assures each buyer that he is buying as favorably as his competitor.

"One hardy individual has survived the N.R.A., the P.I.A., Supreme Court decisions, booms and periods of depression. In fact he thrives and grows stronger during depressions while others weaken. He is none other than our old acquaintance, the chiseling buyer. He still chisels and will continue to chisel as long as mill executives or salesmen are foolish enough to believe him, but thanks to the confidence existing between our members, his destructive tactics do not succeed as easily as in bygone days. With more mills backing us up through membership, we can still more effectively curb this pest.

"When the N.R.A. was declared unconstitutional, the P.I.A. automatically ceased operations. The government was forced to stop its efforts to control and regulate every act of business. This placed heavier responsibility on our industry. Whether the industry is going to progress from now on will depend largely on those who profess and call themselves salesmen. If we are worthy of the name, we must sell our products on a basis that will not only permit payment of fair wages and salaries, but also yield a fair return on the capital invested. For many years this fair return has been conspicuous by its absence. We should always keep in mind that neither we as individuals nor our companies can long prosper unless our industry as a whole is prosperous.

"Customers frequently call me up asking where they can buy some paper not made by my company. I take from my desk a green covered book and give the names, addresses and phone numbers of members who sell the desired item. This handy little book is our A. to Z. directory edited by our first president and ever loyal friend, George, K. Gibson. This is only one of the many splendid things that he has done for our association and I am happy to say that Mr. Gibson will soon edit a revision. This will include all members in good standing, making it a "Who's Who" for the selling end of the paper mills. The new edition will be improved by the addition of a complete list of manufacturers having representatives in the Salesmen's Association.

"In closing I wish to express my deep appreciation of the valuable support of the trade press. To the Annual Luncheon, the Executive and Advisory Committees, as well as to the many individuals who have so willingly responded to every call, I extend my sincere thanks for their splendid cooperation throughout the year. If you will give this same whole-hearted support to your new officers and President-elect, I confidently predict that this association will expand and increase its usefulness more and more."

Approximately 700 members and guests attended the Annual Luncheon of the Salesmen's Association of the Paper Industry, which was held in the Grand Ball Room of the Waldorf-Astoria, on Tuesday. Creighton W. Whit-

ing, the retiring president, was an efficient chairman and toastmaster.

Theodore J. Grayson, LL.D., Professor of Finance of the Wharton School of Business, University of Pennsylvania, was the principal speaker. He discussed "American Business—the Short and Long View," and said, in part:

"I think that the following principles should guide the problem of relief:—

"1. That it be conducted only with regard to worthwhile projects which will add to the community value and which will not constitute an undue burden of maintenance.

"2. That wages paid in relief be below the general level of wages so that there will be an incentive for men to seek regular employment.

"3. That the administration of relief be decentralized as much as possible and be organized on a State basis with as little national dictatorship as can be managed. This includes the requirement that the States assist in financing their unemployment program as is done in the case of Federal assistance to highways.

"In the second place, I believe that we must balance our budget as soon as possible, but not so rapidly as to cause severe economic disturbances. I believe we should immediately proceed to study our governmental departments to see what is necessary and what has been merely added to them in a moment of hysteria. I also believe it absolutely necessary that the administration present its full requirements for any single period to the Congress of the United States at one time. The practice has been in recent years to present first the ordinary expenses and then the emergency expenses. Consequently, the full requirements of the government have seldom been faced as a whole. I believe that the sooner we educate both Congress and the public as to what is involved in the program on which we have embarked, the better it will be for all.

"In the third place, I believe that we should eliminate as much as possible the grab bag theory of the Federal Treasury. In the entire history of our nation, especially since Andrew Jackson, we have done entirely too much of this, and I think it is time that we viewed our government in the light of personal responsibility rather than as a source of privilege and remuneration.

"And now, what shall we do about money? In the first place, let me say that anyone who advises currency inflation is in my opinion advising the most harmful thing that could possibly be done. You may talk about controlled inflation all that you care to, but until someone else proves that it can be controlled, I am unwilling to be the guinea pig for the experiment. The history of inflation in Germany, France, Belgium and Italy after the War should constitute a thorough warning to the American people that the prophets of the millenium who would solve all our ills by the printing press either know nothing about money or are guilty of the most reprehensible kind of intellectual dishonesty.

"There is only one way of settling this money problem. The first portion of that way is to reduce expenditures wherever possible. The second portion is that very unpleasant but sound method of raising funds, known as taxation. When it comes to taxation, let me say that you will get very little more out of the income tax. Compared to the billions which must be raised, the most severe kind of income tax will contribute but little to the total required. We must, therefore, look, I believe, to taxes on specific commodities and to similar means. I am against a general sales tax because I do not like to see a burden placed upon the essentials of life. However, taxes on amusements, on luxury clothing and other articles in price classes not essential to the maintenance of an ordinary standard of living, on cosmetics on which American women spend more than a billion dollars annually and on similar non-essentials must constitute one of the principal means of raising the necessary funds.

"While on the subject of taxation, let me say that I believe that all businesses should do as the gasoline and oil industries have done, namely, that in presenting their prices they state the price without the tax and the amount which has been added to that price by reason of the tax. The sooner the American people are educated to the fact that government costs something, the sooner they will begin to examine that cost and the sooner this happens, the sooner again will they weigh carefully the demands they make upon it for services. I might add that I think we should begin our taxation immediately.

"The problem, therefore, is particularly one of exchange and of creating a system of distribution. This will not be a simple task, but will require the combined attack of the entire business community. However, it can be achieved. Lowered prices, and raised real wages for the consumer, new and better designed products, including the development of new industries, industrial co-operation, are some of the means by which our potentialities may be realized. Finally, the international situation also must be viewed dispassionately. We must deal with the rest of the world somehow and we must determine to what extent we shall deal with them and how it can be done best on a mutually profitable basis.

The chairman introduced F. J. Sensonbrenner, president of the American Paper and Pulp Association, who addressed the gathering briefly, as follows:

"I am very glad to be with you today and to extend to you the greetings of the industry in behalf of the American Paper and Pulp Association. It is gratifying to see such a large number in attendance. It speaks well for your past record and promises much for the future.

"None of us is sorry that the past few years have past. They were not pleasant years; they were, more than anything else, a struggle for mere existence. Too frequently such a struggle breeds hopelessness, for it tends to kill initiative and spirit. Yet in the midst of it we have as an industry created some new records. For the first time in our history we now have an organization structure that ties together through direct and affiliate membership all the industry's group agencies. Today we can deploy our forces like a well organized army on attack.

"The industry hovers, I believe, on the verge of a great forward movement. In fact, it made notable progress in 1935. At yesterday's meeting, I was profoundly impressed by the reports of the Association's Governors on business conditions in the Divisions. The reported increases in volume of sales indicate that a truly remarkable recovery was made in 1935.

"But I was also worried by these reports, for in each there was an undertone of dissatisfaction. It was evident that the industry had not fully realized upon its greater sales. In spite of the rise in 1935, our volume of sale has not yet risen to a point that generates firmness in prices. Many companies, even some large groups in the industry, are still operating unprofitably. This is not wholesome.

"How many of us realize our responsibilities in regard to prices? Back of every sale is an organization composed of workers, managers and investors. The aggregate of these organizations in our industry mounts up to over two billion dollars in capital, nearly 150,000 workers and a large but unknown number of investors. These people and these resources are dependent upon

the efficiency of our selling forces and upon our individual selling policies.

"We have learned through bitter experience what happens when prices sink below cost levels. We have but to look back to 1932 to see the devastating effects of competitive warfare. Then the combined recession of prices and volume created a chaotic condition from which none of us could find protection. We all suffered, 150,000 workers, the thousands engaged in producing our raw materials and in marketing our products and our investors.

"In the past two and one-half years, we have stopped the devastation of our resources. But we have not yet begun the accumulation of the reserves that are necessary to modernize our equipment, to improve our products and to better our working conditions. All of this lies ahead of us.

"In the last drive to successful company and industry operation each of us faces heavy responsibilities. Those that rest upon the salesman are especially heavy, for his efforts largely govern the income upon which progress depends.

"The salesman, the attacking force of the industry, meets the brunt of the competitive battle. He constantly faces pressure for lower prices, pressure to give concessions. He is told hourly that his prices are too high. Every rumor finds him. He must be strong indeed to hold his ground in the fact of these pressures, to stand firmly upon his company's policies and for his company's welfare. In his ability to do this lies not only his own economic progress but the welfare of the industry. We must not forget that personal and industry welfare are something more than distant relatives; they go hand-in-hand.

"In the industry's organizations, the salesman has ample means of checking rumors and of ascertaining what is the truth. In a real sense every Divisional Association is a salesman's association whose duty is to have and to distribute correct information. Rumors may be checked literally in a moment's time. Correct information is waiting on the other end of your telephone. It is yours, not only for the asking, but because your company has helped pay for its collection.

"Ours is a growing industry, for centuries it has been moving forward and upward. It is destined to continue on to new records of production, to new levels of service and to new standards of personal compensation. Of these none stands alone. We profit when our industry profits; we progress in one body. We owe it to ourselves to give to our industry our best effort every minute of every day."

## Glassine and Greaseproof

The following officers were elected for the ensuing term by the Glassine and Greaseproof Manufacturers Association:

Chairman, Folke Becker, Rhinelander Paper Company, taking Robert F. Nelson's place. The Executive Committee includes: Folke Becker; Olaf Hedstrom, Hartford City Paper Company; Paul E. Hodgdon, Deerfield Glassine Company; Robert F. Nelson, Glassine Paper Company, and John L. Riegel, Riegel Paper Corporation.

When Mr. Becker took the chair following his election he stated that he had accepted the chairmanship only with the greatest hesitancy in view of the very excellent work that had been done by Mr. Nelson during the two years he had been chairman of the Glassine and Greaseproof Manufacturers Association. He stated, however, that Mr. Nelson had requested to be relieved of the responsibility and, therefore, had accepted the honor when tendered to him.

He did desire to state, however, that the association under Mr. Nelson's guidance had functioned excellently and he hoped that the same would hold good during his term. However, he knew this would not be possible unless he received the full cooperation of all manufacturers making Glassine and Greaseproof and felt sure he would receive this cooperation.

Mr. Nelson was tendered a very hearty vote of thanks by the members of the Association for the excellent work he had done for them. Mr. Nelson thanked the members with a few well chosen words for their kind resolution and stated that it had been a pleasure for him to serve the Association because he had found them congenial to work with and willing to give him advice and assistance whenever he called on them.

## Sulphite Paper Manufacturers Association

The Sulphite Paper Manufacturers Association, at its annual meeting held Tuesday afternoon, February 18 at the Waldorf-Astoria Hotel, elected the following officers and Board of Governors:

General chairman, Rufus L. Sisson, Jr., Racquette River Paper Company; vice chairman, Unbleached Group, George Stuhr, Continental Paper and Bag Corporation; vice chairman, Bleached Group, Rufus I. Worrell, Mead Sales Company; vice chairman, Manilas Group, W. M. Benzing, Champion Paper and Fibre Company; vice chairman, M. G. Sulphite Group, Edgar W. Kiefer, Port Huron Sulphite and Paper Company; John E. Alexander, Nekoosa-Edwards Paper Company. Aubrey Crabtree, Fraser Industries, Inc.; Walter B. Merlin, Hollingsworth & Whitney Company; Richard A. McDonald, Crown Willamette Paper Company; John Stevens, Jr., Marathon Paper Mills Company; William A. Cohen, Elk Paper Manufacturing Company.

Group meetings and luncheons featured convention activities of the association.

## Tissue Manufacturers

The Association of Manufacturers and Converters of Tissue at its annual meeting held at the Waldorf-Astoria, Tuesday, re-elected C. W. Renck, of the Crystal Tissue Company, as president. Ralph Rhodes, of the Scott Paper Company, was elected vice-president and B. F. Picola, of the Gotham Tissue Company, was re-elected treasurer. M. H. Lund, 122 East 42nd street, is secretary of the Association.

The following chairmen were elected for the several groups affiliated with the Association of Manufacturers and Converters of Tissue: George Dunn, of the Dunn Sulphite Paper Company, chairman of the Jumbo Roll Group; C. Alfred Wagner, Stevens and Thompson Paper Company, chairman of the Interfold Toilet Tissue Group; Frank Vaughan, chairman of the Paper Towel Group; H. Wintgens' Hoberg Paper and Fibre Company, chairman of the Roll Toilet Tissue Group, and Wayne Brown, Crown Willamette Paper Company, chairman of the Wrapping Tissue and Specialty Group.

## American Waxed Paper Association

The general meeting of the American Waxed Paper Association was held Tuesday morning, February 18, at the Waldorf-Astoria. At this meeting the Board of Governors of the association was elected as follows:

Van H. Wilshire, Specialty Paper Company, Dayton, Ohio; James R. Carter, Nashua Gummed and Coated

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Paper Company, Nashua, N. H., and Walker Hamilton, Riegel Paper Corporation, New York.

The Executive Committee consists of the following:

Wm. J. Eisher, Newark Paraffine and Parchment Paper Company, Newark, N. J.; Howard Larsen, Crystal Tissue Company, Middletown, Ohio; Preston E. Roberts, Mid-West Wax Paper Company, Fort Madison, Iowa; H. O. Nichols, Western Waxed Paper Company, Oakland, Cal.; Leo E. Croy, Menasha Products Company, Menasha, Wis.; Leslie L. Jacobs, Pollock Paper and Box Company, Dallas, Texas, and Karl Zimmer, Zimmer Paper Products Company, Indianapolis, Ind.

## Kraft Paper Association

The election of officers featured the annual meeting of the Kraft Paper Association held Wednesday, February 19.

The officers for 1936 are as follows:

President, L. C. Anderson, Sorg Paper Company; vice-president, J. L. Stille, Southern Kraft Corporation. S. M. Hudson, 19 West 44th street, New York, is secretary.

Executive committee, for one year: Joe Auchter, Nekoosa Edwards Paper Company; J. D. Zellerbach, Crown Willamette Paper Company; Willard Henry, Southern Advance Bag and Paper Company; H. W. Ellerson, Albemarle Paper Company, and C. R. McMillen, St. Regis Paper Company.

For two years: J. R. Miller, West Virginia Pulp and Paper Company; M. L. Cody, Bogalusa Paper Company; W. L. Anders, Nashua River Paper Company; H. S. Daniels, Union Bag and Paper Company, and C. W. Smith, Central Paper Company.

## Writing Paper Manufacturers

At the 75th annual meeting of the Writing Paper Manufacturers Association, the following officers and executive committee were elected:

President, I. N. Esleeck, Esleeck Manufacturing Company, Turners Falls, Mass.; vice president, R. S. Madden, American Writing Paper Company, Inc., Holyoke, Mass.; executive secretary, E. H. Naylor, 122 East 42nd street, New York; treasurer, M. C. Dobrow, New York.

Executive Committee: Chairman, I. N. Esleeck; H. R. Baldwin, Hammermill Paper Company, Erie, Pa.; Norman Bardeen, Lee Paper Company, Vicksburg, Mich.; D. K. Brown, Neenah Paper Company, Neenah, Wis.; H. H. Hanson, W. C. Hamilton and Sons, Miquon, Pa.; H. F. Harrison, West Virginia Pulp and Paper Company, New York; G. P. Lee, Eastern Manufacturing Company, New York; H. A. Legge, Howard Paper Company, Urbana, Ohio; R. S. Madden, H. A. Moses, Strathmore Paper Company, West Springfield, Mass., and F. H. Savage, International Paper Company, New York.

## U. S. Pulp Producers Association

At the annual meeting of the United States Pulp Producers Association held Tuesday, February 18, at the Waldorf-Astoria Hotel, all the officers were reelected as follows:

President, S. B. Copeland, Eastern Manufacturing Company; vice president, Amor Hollingsworth, Penobscot Chemical Fibre Company; secretary-treasurer, O. M. Porter.

The Executive Committee for 1936 includes: Stuart B. Copeland; Ossian Anderson, Puget Sound Pulp and Timber Company; Norman Brown, Brown Company; J. M. Conway, Hoberg Paper and Fibre Company; Amor Hollingsworth; Earl McCourt, Consolidated Water Power and Paper Company; J. R. S. McLernon, Rainier Pulp and Paper Company; A. H. Showalter, Mount Tom Sulphite Pulp Company; Norman W. Wilson, Hammermill Paper Company, and R. B. Wolf, Pulp Division Weyerhaeuser Timber Company.

## Ground Wood Paper Manufacturers

The Ground Wood Paper Manufacturers Association at its general meeting held Wednesday afternoon at the Waldorf-Astoria elected the following officers:

President, C. H. Sage, Kimberly-Clark Corporation; Eastern vice president, Samuel Pruyn, Finch, Pruyn & Co.; Western vice president, J. H. Coy, Flambeau Paper Company; executive vice president, R. E. Canfield; secretary, E. O. Merchant, New York.

The Board of Governors include: *East*—Samuel Pruyn; E. G. Murray, St. Regis Paper Company; Walter Shorter, International Paper Company, and Aubrey Crabtree, Fraser Paper Ltd. *West.*—J. H. Coy; L. L. Alsted, Combined Locks Paper Company; George H. Fay, Escanaba Paper Company, and C. H. Sage. *Pacific Coast*—H. O. Nicholas, Crown Willamette Paper Company.

## Bristol Board Manufacturers Association

The Bristol Board Manufacturers Association at its annual meeting on Tuesday afternoon, February 18, at the Waldorf-Astoria, re-elected R. G. Westad, of the Waterfalls Paper Company, president of the association and R. I. Worell, of the Mead Sales Company, as vice-president. The following were re-elected to the executive committee:

S. Dillingham, West Virginia Pulp and Paper Company; Joseph E. Holmes, Chemical Paper Manufacturing Company; Norman Harrower, Linton Bros & Co., and James B. Ramage, Franklin Paper Company. William R. Driver is secretary.

This election of officers concluded the meetings of the association.

## Newsprint Manufacturers Association

The annual meeting of the Association of Newsprint Manufacturers of the United States was held Tuesday, February 19, in the Waldorf-Astoria, at which the various problems affecting the industry were discussed.

The officers for 1936 were elected as follows:

Chairman, A. L. Hobson, St. Croix Paper Company; vice-chairman, C. K. Blandin, Blandin Paper Company and J. D. Zellerbach, Crown Zellerbach Corporation.

Advisory Committee Members are: J. L. Fearing, International Paper Company; Samuel Pruyn, Finch-Pruyn & Co.; R. H. M. Robinson, Minnesota and Ontario Paper Company, and Harold S. Smith, Maine Seaboard Paper Company.

## Cover Paper Manufacturers Association

At the 63rd annual meeting of the Cover Paper Manufacturers Association, the following officers and executive committee were elected:

President, G. H. Beckett, Beckett Paper Company, Hamilton, Ohio; vice president, J. B. Shepherd, Peninsular Paper Company, Ypsilanti, Mich.; executive secretary, E. H. Naylor, 122 East 42nd street, New York; treasurer, M. C. Dobrow, New York.

Executive Committee: Chairman, G. H. Beckett; A. E. Frampton, Hammermill Paper Company, Erie, Pa.; F. E. May, Rising Paper Company, Housatonic, Mass.; J. B. Shepherd; J. B. Van Horn, Holyoke Card and Paper Company, Springfield, Mass.

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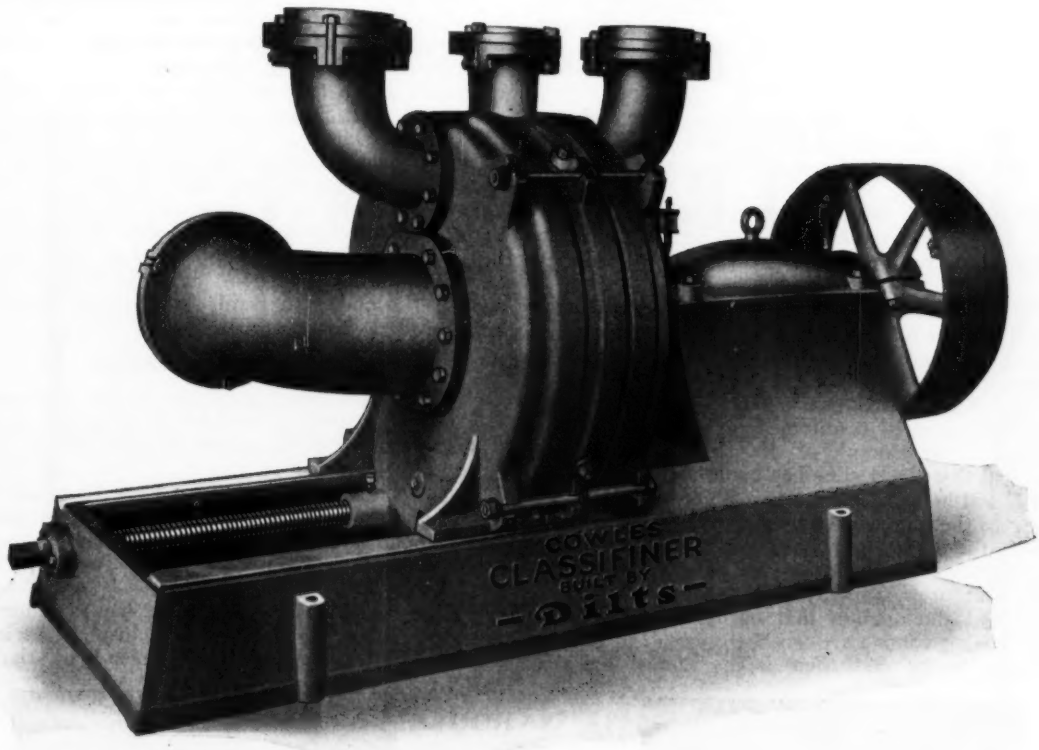


**Read Mr. Cowles' article on page 96 of this issue of Paper Trade Journal for details of this interesting new development.**

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***"Your Paper Is Made in Your Beaters"***

# National Paper Trade Association Meets

Numerous enthusiastic meetings were held during the Thirty-Third Annual Convention of the National Paper Trade Association of the United States, at the Waldorf-Astoria, New York, from February 17 to 20, inclusive.

Officers for the ensuing term were elected as follows: President, O. F. Marquardt, Marquardt & Co., Inc., New York; vice president in Charge of Wrapping Division, F. Bendel Tracy, Fort Hill Paper Company, Boston; vice president in Charge of Fine Paper Division, G. G. Cobean, J. W. Butler Paper Co., Chicago. C. W. Vernon, Vernon Bros. & Co., New York, who filled the unexpired term of Charles Addoms, who resigned recently as treasurer, was elected treasurer at the annual meeting. A. H. Chamberlain, 420 Lexington Avenue, New York, is executive secretary and C. A. Spaulding, J. H. Londergan and W. S. Hewins are assistant secretaries.

### President's Address

At the opening session President H. L. Zellerbach occupied the chair. He directed his remarks mainly at the members of the trade who were not present at the meeting.

President Zellerbach pointed out the need for more and more field work, development of vigorous local associations and financial recognition of the value of association work.

He declared that it is easy to let something useful disintegrate; it is difficult to keep a body moving forward and requires imagination and hard work. It has been a long process of education and it must continue as we need to educate new merchants.

The president pointed to diminishing trade margins in the past year as an example of the need of cooperative effort and said that the decline has made many apprehensive when it will be arrested.

Referring to the mild inflation existent todav with lowered value of the dollar, he pointed out that the merchant is faced with steadily rising costs that will be offset only through the margin of mark up.

He expressed the opinion that efforts to offset such costs of increasing volume are too likely to end in failure. Added to all this, he said, there is the further increase for the future, with taxes coming for social security and old age pensions.

Mr. Zellerbach further declared that when it is considered that sixty per cent of our expenses are pay-roll, it is not difficult to see that a 3 per cent tax on pay-roll will eventually increase our costs of doing business by 1 per cent. That may spell the difference between profit and loss unless trade margins are maintained.

He also urged that merchants ask paper mills to tighten up on credits which, if too widely extended, merely invite additional competition. At the same time, he said, mills should be urged to more carefully discriminate between classes of buyers.

Some mills, he pointed out, sell direct to converters in competition with merchants and as the large converter has large business to place, the merchant soon becomes a secondary consideration with him.

Drastic action may be called for certain conditions, he continued, how for example did the wholesale grocers meet growing chain store competition? Something should be done to aid the individual grocer. They developed the cash and carry system on many staples, including paper bags. We of the paper trade may also have to do something equally unusual, in the opinion of the speaker.

Mr. Zellerbach stressed the value of the trade association and the necessity for financial support again and again. "I wonder," he said, "what would happen if next Friday we closed up and locked the doors?"

### Greetings from APPA

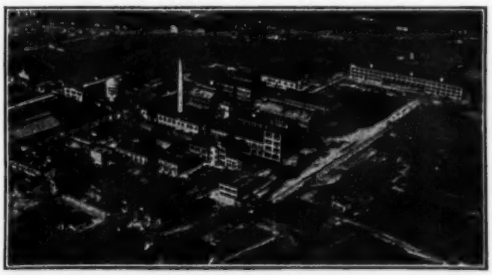
F. J. Sensenbrenner, president of the American Paper and Pulp Association, brought the greetings of his association to the members of the National Paper Trade Association: He said:

"I am glad to bring to you the greetings and the good wishes of the American Paper and Pulp Association. Our Associations have met together many times in the past. I feel that we are building traditions of cooperation and confidences.

"Today more than ever before we have need of cooperative action for upon what industry does in the immediate future to regulate itself depends to a large extent

O. F. MARQUARDT, President

A. H. CHAMBERLAIN, Secretary



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the course of industrial legislation. Industry has emerged from one period of experimentation in Governmental control and regulation with a wholehearted distaste for it. Yet there are pending in Congress many revolutionary bills, some of which are definitely pointed toward Federal regulation.

"The O'Mahoney Bill providing for Federal licensing of all corporations, among other things; the Black-Connery Bill which would establish a 30-hour week for all wage-earners, and numerous proposed amendments to the Federal Trade Act that are designed to give the Federal Trade Commission greater power over industry, are outstanding examples. These proposals cannot be passed over as absurd suggestions of radical groups for they have widespread support. The extent to which their provision may eventually become law depends upon industry's demonstration that it can govern itself.

"We look upon 1935 as the year when the economic pendulum definitely began to swing upward. Business showed great improvement, especially during the last six months. The paper and pulp industry shared in the upward movement. Encouraged by this success, we look forward to 1936 in anticipation of further improvement. In so far as consumption is concerned, future prospects are bright. The question in every executive's mind is how best may he profit by the opportunities that the greater consumption promises.

"Without doubt one essential to realization upon these opportunities is that manufacturers and merchants understand each other's problems and risks. The marketing of paper is extraordinarily complicated. Irrespective of the number of grades and the volume of sales, the channels and the methods of distribution have grown to be complex; and when to this are added the further complexities caused by our lack of grade structure, the market structure becomes confusing.

"I have felt that the grading programs of the Divisional Associations were handicapped not only by the lack of suitable instruments but also by the lack of a dependable classification of existing instruments. The American Paper and Pulp Association financed its Central Grading Committee in a study of this subject. Progress reports, constituting a most complete analysis of the instruments for testing paper, have been recently distributed.

"To my mind, this work constitutes an outstanding contribution, but it does not yet cover the whole field. I hope that the Association can resume this study in the near future for only when we have proper instruments, can we arrive at grade specifications that mean the same regardless of the manufacturer or of the tester.

"I believe that consumers are interested in grading for it tends to simplify purchasing. I have been told that some consumer groups are now attempting to establish grade specifications. I am inclined to believe that such action is not wholly sound for consumers cannot have a complete knowledge of production technique and costs. Basically, grading is a manufacturer's problem; but it needs the knowledge and experience of merchants and consumers and their endorsement and promise of use.

"The pricing of paper is the common meeting point of manufacturer, distributor and consumer. I have frequently heard it said in respect to the paper industry that profits have not been made in selling but in buying. That may not be wholly true, but there is more truth in it than many of us realize. It is particularly true during periods of slack production in what we term 'buying cycles'. None of us need to be told what are the consequences of unstable prices.

"Theoretically, each step in the process of producing and distributing paper should be properly priced to cover costs. Sound business demands this adequate coverage and that each person in the chain claim his share. Stable mill and resale prices are important to the merchant and manufacturer alike. Maintenance of reasonable price levels was admitted in the National Industrial Recovery Act to be necessary in modern business and that Act provided means for obtaining stability: that proper stability is equally important to the consumer so that he may properly plan for his own business.

"As we look back upon the code period, we must recognize the influence of correct information upon the industry's welfare. Chiseling was remarkably absent; in fact the industry was probably freer of price cutting than ever before in its history. A degree of stabilization was attained that made possible increases in employment and in wage rates.

"Today we are upon our own. Our actions are purely voluntary. Is it possible to maintain by voluntary action the records that were established in the code period? Upon our answer to that question depends the extent to which we can preserve our freedom of action."

### Secretary's Report

A. H. Chamberlain, executive secretary of the association, spoke as follows:

"A brother secretary said to me the other day, 'I've quit presenting reports to my crowd. If they don't know what I've been doing and realize what the Association's been worth to them without telling it over to them now, I'd just be wasting my time and theirs.'

"This man serves a comparatively small group and his remark probably would not be a sound general rule but there's a big kernel of sense in it. If after 33 years of existence and several recent years of enlarged and progressive activities, an overwhelming majority of the members of this Association are not conscious of its beneficial influence and operations, do not recognize that the results of its discontinuance would be serious to them, if they do not regard their small proportionate share of its expenses as an essential part of their business overhead, certainly their idea cannot be corrected by a member of the staff, stigmatized by the fact that he makes his living from the Association job.

"Some of us might be able to get a living in a much less laborious, exacting, nerve racking and discouraging way. But there is something about this kind of work that gets under your hide after you really understand it and makes you feel you must stick to it because it would be too bad if it wasn't done. A sincere and conscientious man in this kind of a job takes it to bed with him. He knows no business hours and has little time that he can safely call his own. Excuse my saying with some warmth that those are the kind of men you have on your staff.

"But if I was an officer or committeeman, Executive or Commodity, or local leader undertaking unpleasant and perplexing tasks, sacrificing my spare time and exhausting my energy, I would have something to say to those who did nothing but find fault and who begrudged or refused to chip in a few dollars toward expenses incurred in their interest and beneficial to them as much or more than to myself.

"I have had an officer of this Association say to me, 'Why was I fool enough to let myself in for this? I am so sick and tired of it, I could kick it through the window. It is a handicap to my own business. Why should I stick alone and continue to suffer?' Can you blame him? But he's not a quitter. The mood passes and next day or next week, he is again studying, planning, patiently ex-

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plaining, giving you all he's got.

"So this time, I'm not making you a report of trade developments of the voluminous work and the many varied activities of recent months. They have come to you in many ways. If, as my brother secretary said, you don't know about them, its no use to tell you now. And, speaking of brother secretaries, we have a sister secretary in our own ranks, an unpaid one, who knows a thing or two about her job. She sent this to the office the other day. An executive, who had something very important to get across to his organization, issued a bulletin and on one of the early pages included this sentence: 'I will send $5.00 to every one who reports that he has read this far'. Not one report came in; it didn't cost him a cent.

"Instead of a report, let me cite a few facts that seem rather significant just at this time. In preparation for this meeting and the questions before us, I have been making a little research. This Association entered last year on a program of expansion and more aggressive work. A budget for the year of approximately $66,000 was adopted but was subsequently revised by the Executive Committee to approximately $70,000. We had about a $20,000 surplus, however, and because of Code burdens on the members, we only assessed about $58,000.

"Well, my research developed that we had a budget of $58,000 once before and when do you think it was? 1931. That wasn't a boom year, was it? And in 1931 we allocated assessments of $58,000 on a membership almost exactly 200 less than it was at the beginning of last year. The average cost to the entire membership for the former year was $10 a month, and last year it was only about $8.75 per month. In 1927 with a budget of $53,000 raised from 390 members, the average cost per member was nearly $11.50 per month.

"In 1931, the year mentioned a moment ago, when the budget was $58,000, the staff included Frank Floyd, myself and two stenographers and the membership was 480. For more than a year after Frank Floyd's death, the force consisted of myself, Miss Shepard and an office boy. Do you want to go back to that set up, whoever might be the executive, in order to reduce assessments by an average of 50 cents to $1.00 a month per member, or by $1.00 per year per employee or by 5 cents per $1,000 of annual sales?

"Regardless of complaints, the Paper Trade is conscious that a strong and efficient National Association is indispensable. Whatever they may say, they have become accustomed to it, they depend on it and expect it to function as point of contact, source of information, negotiator and guide. If definitely faced with its dissolution, with the loss of its agencies and activities, they would willingly pay to restore it far more than its present cost of maintenance and operation on the scale expected of it.

"The local secretaries have reported to us a dependable membership of 628 houses for the coming year, almost twice as many as in 1927 and one-third more than in 1931. This is the total enrollment after deducting approximately 70 houses who were counted and assessed as members a year ago but who resigned sometime during the year and ignored their obligation to pay or in some instances just ignored their obligation without bothering to resign.

"I cannot omit to memorialize at this time the outstanding service of Mr. Charles Addoms, as treasurer of this association for the past decade. He felt it necessary to be relieved from the onerous duties of this office but under our By-Laws, he continues a member of the Advisory Council. It is gratifying to tell you that his "Swan Song" as he called it, a letter announcing his resignation and extending New Year greetings to the entire membership elicited scores of replies expressing the affectionate regard, grateful appreciation and good wishes of his friends in the association that was so near to his heart.

## Linweave Announcement Association

Arnett W. Leslie, of the John Leslie Paper Company, Minneapolis, Minn., was elected president of the Linweave Announcement Association, at its annual meeting in the Waldorf-Astoria.

James Wells, of the Sloan Paper Company, Atlanta, Ga., was elected vice-president and John H. Brewer, of the Storrs & Bement Company, Boston, Mass., was re-elected secretary-treasurer.

Harold L. Zellerbach, president of the Zellerbach Paper Company, San Francisco, Cal., and Edward P. Magel, newly elected president of the Crescent Paper Company, Indianapolis, Ind., were elected to the executive committee.

Following the meeting a dinner party was held at Jack Dempsey's Restaurant.

## Cardboard Manufacturers Association

At the annual meeting of the Cardboard Manufacturers Association held Wednesday afternoon at the Waldorf-Astoria, the following officers were elected:

President, Kendall Wyman, Champion Paper and Fibre Company; vice president, John B. Van Horn, Holyoke Card and Paper Company. William R. Driver is secretary of the association.

Executive Committee: Donald V. Lowe, Lowe Paper Company; Joseph A. Moses, Falulah Paper Company; F. C. Heinrich, Appleton Coated Paper Company, and Herman R. Harrigan, District of Columbia Paper Manufacturing Company.

## Paper Makers Advertising Club

The Paper Makers Advertising Club, at the annual meeting held February 17 reelected Orin Summerville of the Beckett Paper Company president. Edson Dunbar of Crocker-McElwain Company was also re-elected vice president and M. A. Park of the Marvellum Company remains as treaturer. Chas. Cooley of the American Writing Paper Company was elected secretary, succeeding Richard F. Linsert of the same company. The meeting was followed by a luncheon.

## Paper Machinery Association

The National Asociation of Manufacturers of Pulp and Paper Machinery and Equipment held a meeting Tuesday morning, February 18 at the Hotel Commodore, New York. At this meeting all the officers were reelected as follows:

President, Phillips Dennett, president, Bird Machine Company; vice president, Charles Bauer, president Bauer Bros. Company; treasurer, W. B. Wilshusen, president, Cameron Machine Company; secretary, John Cornell, 1440 Broadway, New York.

## Blotting Paper Manufacturers

The Blotting Paper Manufacturers Association held its annual meeting on Monday, February 17, at the Waldorf-Astoria Hotel. D. A. Smith, vice-president and treasurer of the District of Columbia Paper Manufacturing Company, was re-elected chairman of the association. Henry Mead, president of the Wrenn Paper Company, was elected vice-chairman and James Ryland, vice-president of the Standard Paper Manufacturing Company, an executive committee member.

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# Technical Association Meets in New York

## G. N. Collins, of Stevens & Thompson Paper Co., Is Elected President at the Twenty-first Annual Convention at the Waldorf-Astoria Hotel—Reports of the Officials Show a Sound Financial Position and Increasing Interest in the Work of the Association

The twenty-first annual convention of the Technical Association of the Pulp and Paper Industry was largely attended by technical men from the paper centers of the United States and Canada at the Waldorf-Astoria Hotel in New York from Monday to Thursday of this week. Clark C. Heritage, the retiring president of the association, delivered his annual address as follows:

### Address of the President

The articles of organization of the Technical Association of the Pulp and Paper Industry direct the president to address the association in general session assembled at the annual meeting upon subjects of importance to the association. I appreciate this opportunity to appear before the association as a body and I know of no subjects more important to the welfare of the association than a brief analysis of what we have been doing, and why, and a modest attempt to suggest some elements of the picture in the immediate future.

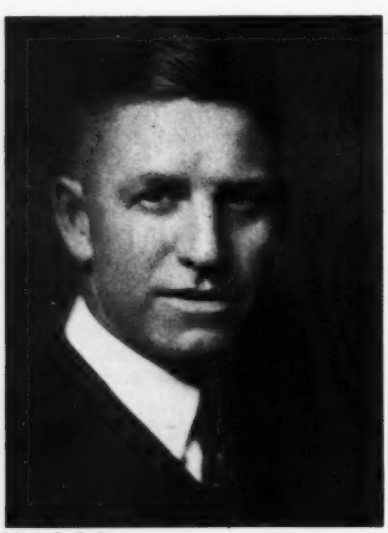
I will not spend more than a moment reviewing the technical position of the industry during 1935. Some branches have had full running time and a satisfactory market and have consequently shown a material improvement. Other branches, although in better condition than during the previous year, have not attained either adequate production rates or adequate prices. It may therefore be said that the industry as a whole still has a considerable distance to go to reach normal and satisfactory operating conditions, with approximately 75 per cent of the productive capacity utilized in 1935. However, substantial progress was made, and the leaders of our industry are displaying an optimistic attitude toward the current year.

The investment of capital in the replacement and modernizing of manufacturing equipment has gone forward considerably more rapidly in 1935, and urged by the necessity for making costs meet prices rather than prices meeting costs, this trend will no doubt continue and perhaps increase. Technologically the battle of increasing costs versus stricter quality requirements has continued unabated. No more need be said on this point because every member of this Association knows the intensity of this conflict.

### Technical Trends of Great Interest Developing

There are unmistakable technical trends of great interest which are developing. Capital is again being invested in new mills for both pulp and paper. Regional Competition is becoming more of a reality, less of a speculation and the basis is broadening to include more kinds of pulps, of papers and paper products. A struggle is in the making between classes of pulps and of papers, bleached sulphite versus bleached sulphate, unbleached sulphite versus bleachable or semi-bleached sulphate, papers processed on the paper machine versus those older varieties processed as a converting operation. Devices of all sorts for indicating, recording and controlling the variables of the stock and of the paper machine are finding acceptance whereas ten or even five years ago few were interested in gadgets of this sort.

The Forest Service is in the midst of a detailed inventory of our forest resources. The physical and chemical make-up of wood is becoming clearer, and there is little doubt but that wood substance and the constituents of which it is composed will take their rightful places soon as the basis of an industry integrated as regards both chemical and mechanical products of a wide variety. The pulping processes are yielding to a concerted attack on cost and non-uniformity, effects of which will be far-reaching in economics and product utility. Waste liquors from pulping processes are beginning to receive the attention they have so long deserved, led by the brilliant yet thoroughly practical developments of one of the outstanding companies of the Middle West. These trends bring to the front all the more, the practical service work of the association and



*Blank & Stoller*

G. N. COLLINS, President

R. T. MACDONALD, Secretary

W. R. MAULL, Vice President

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its value to the members and the industry. The more technology develops in the industry, the greater are the opportunities for TAPPI. If these opportunities are seen and accepted there need be no doubt as to the future of the association.

### Ready for Vigorous and Useful Existence

In my talk last year at this same time I called attention to the fact that our association was twenty years old and about to come of age. This meeting celebrates our twenty-first anniversary and we are now definitely of age. We have presumably formed our character, set up our ideals and are ready for a vigorous and useful existence as an adult body, free to follow whatever course we may choose. This course is determined, at least insofar as policies are concerned, by an Executive Committee of twelve, including the three officers of the association. Executive committee members are chosen primarily with two considerations in mind: (1) to represent adequately the various pulp and paper manufacturing regions geographically without undue emphasis on any particular region, (2) to reward meritorious service in the Technical Committee Organization, and in the Section Organization. This practice is not definitely written into the by-laws of the association because it would not be wise to put it into mandatory form. But in following this preferred practice two ends are gained; a system which might be termed promotional furnishes incentive to members to assume the responsibility for association work, and the association is assured of the benefits in its policy-making body of a group of mature minds who have previously served the association either in the technical committees or the sections. It would seem therefore that the Executive Committee is well established on a sound adult basis.

### Actions of Executive Committee

Let us review briefly the actions which have been taken by our executive committee, we hope for the good of the association, and see whether we have reached true adult status in ways other than merely being twenty-one years old. We must always consider financial matters of great importance, because satisfactory progress cannot be made in any undertaking without adequate funds. A finance sub-committee of four, chairmaned by a member of the executive committee, all residing near New York City, prepares the annual budget for executive committee action, and oversees, by as frequent meetings as may be necessary, the financial operations of the association as budgeted. An operating statement prepared by the treasurer is placed in the hands of the officers and the finance committee monthly so that each of the members responsible in this field is constantly familiar with the financial state of affairs. An executive committee ruling makes it imperative that the budgeted expense be less by a safe margin than budgeted income. Our total expenditures, divided by our total number of members, shows an expenditure per member of about $28 per year. Fifty per cent of this amount goes to literature and publication services, 15 per cent to meetings, 15 per cent to administration of central office operation, 10 per cent to research and 10 per cent to committee and section support. The financial soundness of the association is beyond question. It is therefore evident that we have become of age in this important respect.

### Publication Services

The publication services of the association are probably next in importance. These are of various types and include the Technical Section of the PAPER TRADE JOURNAL, the Annual Volume of Association Papers, the Manual of Standards, the Abstracts of the Current Literature, the Annual Bibliography, the Year Book, the service to member reports, and special bibliographies. We have improved the appearance and utility of the Annual Volume by the use of cloth binding, we appropriate annually a fair sum for new and revised standards, we have provided more direct co-ordination with the A. S. T. M., we are publishing the second volume of the Collective Bibliography 1929-1935—it is now on the press—and we are particularly indebted to Dr. C. J. West for his special bibliographic work. So in this field it can be fairly stated that we have come of age.

I want to call attention at this point to the generosity of Mrs. Ralph M. Snell who has made the association the recipient of the collection of historical books on pulp and paper assembled by the late Mr. Snell, who was chairman of the TAPPI Committee on History and Biography. I want to take this occasion to express to Mrs. Snell the appreciation of the association for this gift.

### Important Policies To Decide

However, like the young man of twenty-one, we will have some important policies to decide in the near future. Is our publication policy a suitable one, involving as it does so many different documents? The service to members reports are not quite as numerous as formerly, partly because our secretary answers many questions directly from previous reports and partly because there are more thoroughly capable technical units in the mills to answer such questions for themselves and a great deal more easily accessible literature to provide ready answers. The Manual of Standards is gradually assuming its proper place as an authoritative compilation, but its growth is slow. Perhaps this is to be expected in the very nature of the undertaking, but to provide the means for more rapid acquisition of standards if possible, the executive committee authorized a new class called suggested methods to include methods and practices known to be of value but not sufficiently proven to take the dignified status of a standard. Then there is the possibility of consolidating our technical publications into one document, issued perhaps quarterly, on a high quality plane with stricter editing and censorship. I want at this time to acknowledge the excellent co-operation accorded the association by The Lockwood Trade Journal Company and to voice the hope that we may continue to benefit by this helpful relation.

Finally, so far as publications are concerned, the executive committee has authorized the appointment of a committee for the production of monographs. With all due respect to the existing book literature, it must be admitted that as technical men we are seriously handicapped by the lack of adequate monographs dealing with relatively small portions of the large field of pulp and paper manufacture, each of which would give a complete, detailed and authorative treatment of the subject, with the state of existing knowledge clearly summarized up to the date of publication. Each of these could then be brought up to date by revised editions at regular intervals of five to ten years or as necessary.

A well-balanced program has been set up and approved by the executive committee.

### Technical Committee Organization

Of equal importance to the future of the association is the technical committee organization. The basic objective for committee work, the reason for the existence of the committee organization is to produce, correlate and assemble new factual knowledge and digest, evaluate and standardize existing knowledge. These activities came to fruition in our meeting programs and our publications. The committee organization was set up essentially as now known during 1930 and 1931 and has not been appreciably modified during these five years. I believe I am correctly summarizing the judgment of those who are closely in

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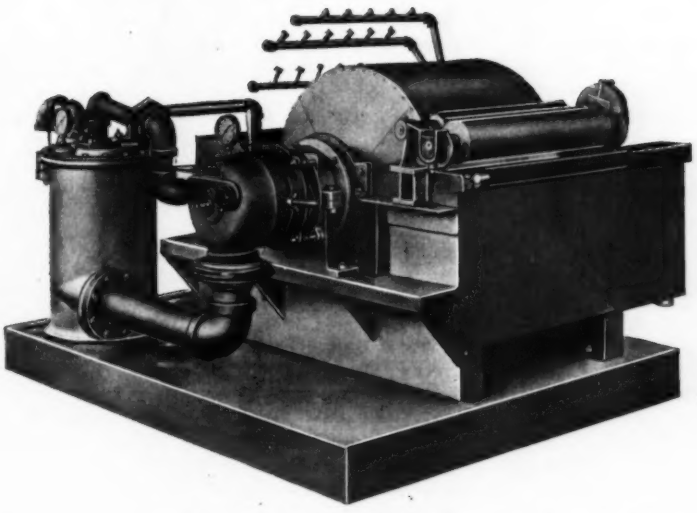
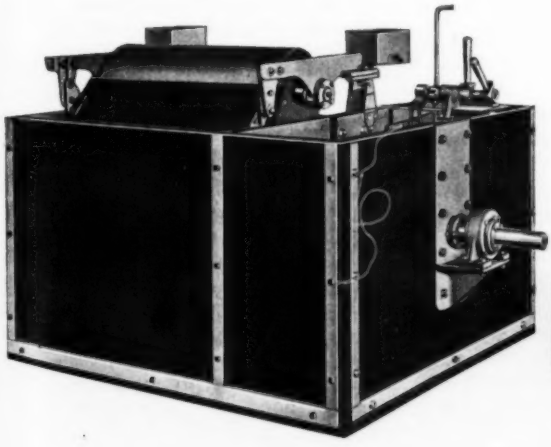
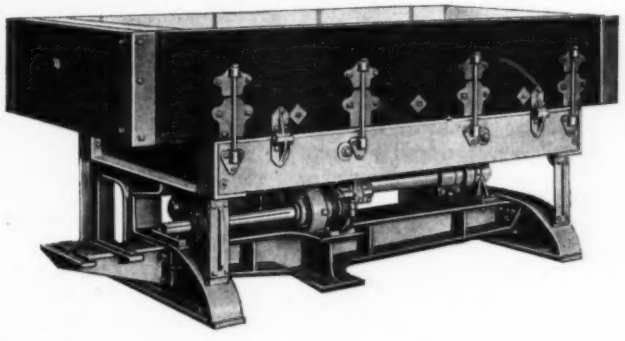
Spray apparatus shown can be removed and press rolls quickly installed. Unit equipped for front Pond Washing and High Density Thickening in same cycle.





At left: "Impco" Cypress Tank Decker with cylinder mould. 30" diameter by 24" length of face completely equipped with anti-friction bearings, automatic stock and water-gate adjusting mechanism.

Below: "Impco" Six Plate Flat Screen, Dunbar Drive, Cypress Vat. Showing bracket attached to end casting for mounting 1-H.P. motor.



*Machines shown above are a portion of equipment recently shipped to prominent Pacific Coast Mill.*

# IMPROVED PAPER MACHINERY CORPORATION

Nashua, New Hampshire

touch with committee work when I say that this organization conception is sound and that largely as the result of technical committee work, the association has had better attended and more enthusiastic meetings. Always remembering that association work is voluntary and without financial reward, the extent to which TAPPI has contributed to the technology of pulp and paper manufacture and use is truly remarkable, and deserving of much praise.

Our annual meeting has been increased from three days to four with all social functions eliminated. It is strictly a business meeting. On the other hand the policy of the association with respect to summer or fall meetings is to make them partly vacation parties, a period of relaxation, enjoyment and good fellowship. Our 1935 fall meeting at Atlantic City was said by many who attended to be just the right combination of technology and vacation. We acknowledge the Delaware Valley Section as perfect hosts, and extend our compliments and appreciation. These trends appear to be healthy. And so we can say definitely we are of age in our committee set-up and our meetings.

### To Expand and Perfect Committee Work

However, we all recognize, I am sure, that there are opportunities on every side to expand and perfect the committee work. Some of the actions in these directions are entirely in our own hands. I refer to such matters as the extension of the more careful planning of committee projects as begun this last year through project authorization requests. I refer also to more concentration of effort upon the completion of standards. I refer also to the guidance of committee work along those lines of the greatest immediate benefit to the greatest number of members. I refer also to the building of committees as teams, co-ordinated, unified groups of members who engage in committee work with enthusiasm, actuated by the satisfaction of accomplishing something worthwhile, of serving their fellow members. As an association we can hold out no other reward than work for the works' sake. To some individuals this does not constitute an attractive proposition. To others it presents an unusual opportunity for technical accomplishment. It is to this latter group that we must look for our committee work, and particularly our committee chairmen.

Some of the plans toward expanding and perfecting the committee work involve elements outside the association proper and are not therefore entirely in our own hands if we prefer to follow a diplomatic course. I refer to the establishment of a committee or even a division handling matters of forestry and wood procurement. One need only recall several previous meetings we have held or one needs only to attend certain of the Canadian meetings to realize the magnitude of this deficiency in our annual meeting. I refer also to the expansion of the activities of the management division. Likewise the expansion of our committee work into the field of specifications, particuarly raw material specifications, requires co-operation with the A. S. T. M. and careful, mature deliberation to deal fairly with both consumer and producer. This work, so far as raw materials are concerned, falls in the field of the raw materials division, and this afternoon and Tuesday afternoon a certain period will be devoted to open discussion of this important activity with respect to several common raw materials. And so these plans, involving outside elements, require patience and careful deliberation that the association may advance soundly yet harmoniously.

### Perfecting Performance of Committee Organization

The executive committee has given a great deal of thought to ways and means for perfecting the performance of the committee organizations, always recognizing that it is a voluntary service done without material reward. Three lines of assistance have crystallized, all of which will be of benefit in the years to come, but must again be built conservatively, soundly and with judgment.

The first of these involves the publicizing of committee and association accomplishments, the effectiveness of which, if properly done, in building prestige, can hardly be doubted. Our committee on public relations guides this activity. Our meetings are being given press publicity of suitable kind and consideration is being given to summarizing our accomplishments, particularly in committee work, at regular intervals in concise and entertaining manner and placing this as a small good-will publication in the hands of the executives of the industry.

The second line of assistance was announced last year and has been put into operation this year. It consists in making available to the committees a certain sum of association money so that projects which cannot be prosecuted by the older methods of pooling existing knowledge or arranging gratuitous studies can go forward properly financed in any research center which is suitable for the work involved. This activity has hardly gotten under way in one year, although progress reports of two projects will be given at this meeting. This financial assistance will become an increasingly important tool in the hands of the committees to expand and perfect our work.

The third of these involves much closer co-ordination with the general research work of the Institute of Paper Chemistry, of which TAPPI is now an associate member. Although the details remain to be worked out, the assistance of the Institute of Paper Chemistry in furthering committee projects is assured.

The awarding of the TAPPI medal to individuals for outstanding contributions to the technology of pulp and paper has been continued. With the presentation of the medal to Mr. Millspaugh on Thursday, there will have been five medals granted. This presentation has become one of the most enjoyable features of our meetings, and as the years continue, the TAPPI medal will identify the men who have been largely responsible for the outstanding technological advancements of the industry. In providing this specific and dignified means of recognition, TAPPI takes its place among professional societies as again having come of age.

### Local Sections

The chartering of local sections of the association as now recognized originated in 1929, and with the installation of the Miami Valley Section in October of last year, the number of sections now stands at six. In every case they are strong, virulent, self-perpetuating groups of which the parent association may well be proud. Their meetings are enthusiastic, well attended and well managed. It is particularly gratifying to see the growing tendency for very successful meetings to be held jointly with the American Pulp and Paper Mills Superintendents' Association. Thus in its sectional organization TAPPI has without doubt come of age.

To summarize then, the association has reached adult status not merely celebrating its twenty-first annual meeting, but in its financial condition, its publications, its Technical Committee organizations, its meetings, its standards, its financial support of research, its medal awards, its sections. But like a young man reaching the age of discretion, it has manifold opportunities to improve and perfect its position and its prestige, which will require, in the years to come, wise and careful planning and administration.

In closing, I want to avail myself of this opportunity to express my appreciation and admiration for the fine work which has been done by the other officers, the executive committee, the technical divisions and committees, and the

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# *to industry by du Pont*

DURING THE WAR, when dyestuffs could not be obtained from abroad, American dyestuffs users faced a desperate situation. There was a possibility of tying up plants completely, as this country produced only about five per cent of the dyes consumed. The du Pont Company, realizing the vital need for a self-contained American industry, centered all the knowledge and skill of its research chemists upon its fulfillment. Tremendous obstacles had to be overcome and, after months of research and experimentation, synthetic indigo, a much needed product, was perfected and placed upon the market. This was early in 1918. Today du Pont is one of the largest producers of indigo in America.

Other dyes for which there was the greatest need were next given careful consideration and put into the research and production schedule. From time to time numerous other products were added to the line, new specialties were created, such as dyes for the lake and printing ink trade, special colors for paper and for synthetic yarns. Gradually this relatively small but vital industry has grown, and today there are over 1200 dyestuffs available to the consuming industries, comprising a complete line of colors for the dyeing of cotton, silk, wool, rayon and acetate yarns, paper, leather, etc.

Some of the outstanding achievements in the realm of paper dyeing for which du Pont research was responsible are:

*Development of non-two-sided formulas for clay-loaded sheets, and in establishing formulas for sheets loaded with calcium carbonate and other highly alkaline fillers.*

*Establishment of importance of pH control in paper dyeing and furnishing of pH tables for use in mills.*

*Development of a line of dyes for the production of non-two-sided and fast-to-light bond and cover papers.*

*Improvement of qualities of dyes originally designated for textile use to meet paper mill conditions.*

To assist the user of dyestuffs in applying them most effectively, a range of chemical assistants has been developed. These comprise wetting, penetration and dispersing agents, products for the prevention of mildew and fungoid growths, particularly on food wrappings, waterproofing and felt washing agents, as well as many others. Completely equipped laboratories with trained staffs are maintained to help mills in matching shades and working out special color formulas. Technical experts, versed in paper manufacturing technique, are also at the disposal of mills to give service on any unusual and intricate problems.

Chemical progress must go forward —every day this organization is striving toward the development of newer and better products, so as to furnish the dyestuffs user with colors which will answer his future technical and commercial requirements.

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sections in forwarding the accomplishments and upholding the position of the association in the industry. I have found a spirit of co-operation and self-sacrifice which, so far as I know, cannot be matched elsewhere. I cannot take the time to mention particular individuals because literally dozens have contributed to the progress of the association. But I do want to say what I have said many times before, that every one of the division and section chairmen deserves personal mention, for the load they carry is heavy, and on the carrying of it depends the future of the association.

I know of no better watchword for the association than a thought expressed by one of our famous men of letters, "Nothing great was ever achieved without enthusiasm." May we never lose our enthusiasm for our association.

### Report of the Secretary-Treasurer

R. G. Macdonald, secretary-treasurer of the association presented his annual report as follows:

During 1935 the Technical Association made important advances due in part, to the returning prosperity in the industry and the growing emphasis that there has been on technical details as a sequence to the activities of the various trade organizations during the period and since the period of the National Recovery Act enforcement.

### Membership

In 1935 there were 186 members elected and 69 resigned or were dropped from the membership. On December 31, 1935, the total individual membership was 1,244. This is a new record for membership.

There were six Corporate members and 17 Contributing members elected. The Corporate membership on December 31, 1935 was 70 and the Contributing membership was 66.

The companies that became Corporate members in 1935 were: Bird & Sons, Bogalusa Paper Company, Gilbert Paper Company, Container Corporation of America, Cartiere Burgo (Italy), Kupfer Brothers Company.

The companies that became Contributing members were: A. M. Meincke Company, Crane Company, American Brass Company, Mathieson Alkali Works (Inc.), Electro Bleaching Gas Company, Johns-Manville, Reliance Electric and Engineering Company, Bauer Brothers Company, Testing Machines, Inc., Thwing-Albert Instrument Company, Stowe-Woodward, Inc., Oliver-United Filters, Inc., Castle & Overton, Inc., Gottesman & Co., Chemipulp Process, Inc., Lagerloef Trading Company, Inc., Rice, Barton & Fales, Inc., W. S. Tyler Company, Combustion Engineering Company, Inc., Samuel M. Langston Company.

### Necrology

The Association regrets its loss through death, of the following members in 1935. Henning Arbo, W. Ross Campbell, George R. Wyman, Alonzo B. Bradley, Amos L. Allen, Joseph H. Slater, Arthur D. Little, James L. Carey, L. F. Parmenter, Aleks Lampen.

### Special Reports on Manufacturing Problems

The handling of many of the association inquiries by committees and the preparation of papers at meetings based on these returns has decreased the number of special reports somewhat. In view of this trend, it may become advisable to change the nature of these reports somewhat and have them contain information not based entirely on the returns from questionnaires. The Special Reports issued in 1935 were:

No. 231. Non-Fibrous Materials Specifications
232. Trimming Soft Papers
233. Repointing Acid Towers
234. Sheet Finishing Rooms
235. Sulphite Relief Gas Testing
236. Methods of Furnishing Beater
237. Sticking of Glassine to Top Roll of Supercalender
239. Storing Groundwood
240. Calendering of Coated Paper
241. Data on Coated Paper Testing Methods
242. Heat Requirements for Sulphite Pulping
246. Laid Marks on Top and Bottom of Paper
247. Hand Sheets or Color Matching
248. Residual Moisture in a Sheet of Paper
249. Refining Equipment for Kraft Wrapping Paper

### Service to Members and Employment

During the years of the depression the association headquarters devoted much time to keeping members employed. From the standpoint of employment, at least the paper industry was more fortunate than most industries, and but few members remained unemployed for any considerable period of time. As a result of the association's activities in this field most of the companies in the industry now notify the association of their needs for engineers, superintendents, chemists and managers prior to seeking them through other channels. The association will continue as a clearing house for this service and will keep a list at its office in New York, of available employes and jobs.

The association receives daily a number of requests for information. Most of the information is supplied immediately and through the generous cooperation of a large number of members, the best available information is supplied to those in need of assistance.

The accumulation of a tremendous amount of valuable data in the Special Reports and other association literature enables the organization to render important service to the industry.

### The Fall Meeting

The 1935 fall meeting was held at the Ambassador Hotel, Atlantic City, N. J. About 600 attended. A complete report of this meeting appeared in the Paper Trade Journal of September 26, 1935.

The meeting was sponsored by the Delaware Valley Section of TAPPI and was directed by William R. Maull as general chairman, who was ably assisted by extremely competent committeemen.

### Publications

The PAPER TRADE JOURNAL was the official medium for publishing the association papers, reports and notices. The willingness of George S. Macdonald, president of the Lockwood Trade Journal Company, and Henry J. Berger, editor, to cooperate has been gratifying. The cooperation of other trade and technical publications is also appreciated. Because of the extension of the association's activities in the field of paper and board conversion, there has been a growing interest on the part of publications in this field to keep its readers informed.

The Lockwood Trade Journal Company has kindly furnished the preprints of the fall and annual meeting papers and contributed $500 toward the publication of Technical Association Papers.

Technical Association Papers reached its all-time high in size with 608 pages and was bound in cloth for the first time. The response by members to this improvement was considerable.

The Annual Bibliography and Patent List was prepared by C. J. West of the National Research Council and was issued in March, 1935.

The Year Book for 1935 was issued in September of that year and being a cumulative record of association activities, was about thirty-five pages larger than that published in 1934. It will continue to grow in size even though

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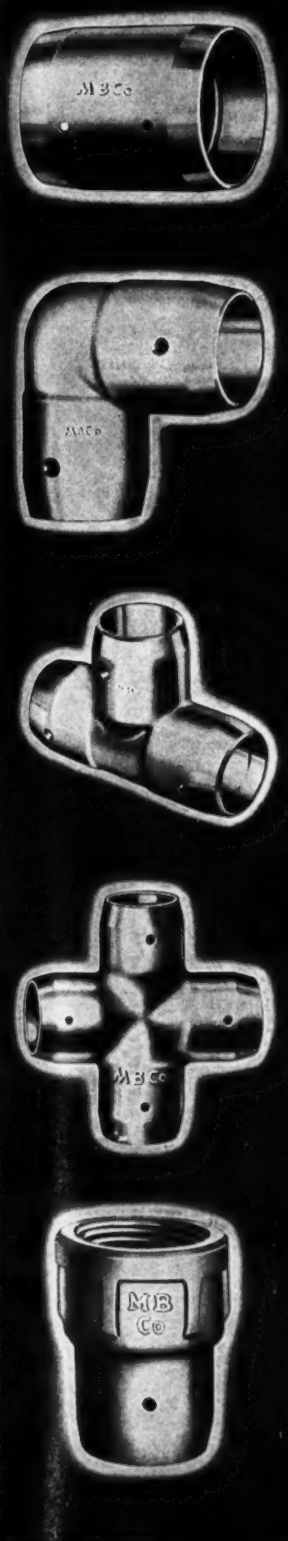


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it will contain nothing that is not indispensable to a member's knowledge of the association's work.

There continues to be a live demand for the TAPPI Manual of Standards. More than one thousand copies have been issued on request and at least once each year a batch of new and revised pages are sent to members who have these loose-leaf binders. Any member may have a copy on request. The price to non-members is $15 per copy. Only members receive the service of regularly receiving the new material. In addition to the Standards hitherto included, provision has been made for the addition of so-called "Suggested Methods," these being procedures in common use but not acceptable as a standard.

A large number of association members have been engaged this year in assisting in the preparation of the third revision of the Textbooks on the Manufacture of Pulp and Paper. The new edition of Volumes III, IV and V are expected to be available in 1936.

### Cooperative Activities

The association is a member of the American Paper and Pulp Association, Institute of Paper Chemistry, American Society for Testing Materials, Inter-Society Color Council. It is represented in the Technical Section of the Canadian Pulp and Paper Association and the Paper Makers Association of Great Britain and Ireland. It cooperates through committees with the Association of Wood Pulp Importers, the Canadian Pulp and Paper Association, the American Oil Chemists Association and the American Society for Testing Materials.

### Sections

The local sections have continued to grow in numbers and in prestige, due largely to competent leadership. Since the sections are largely self-governing bodies receiving little or no interference from the National organization, they have developed interesting individualities. Meetings are held about once a month and the speakers in many cases present subjects that contribute much to the breadth of knowledge of those who attend. During the past year a number of these subjects related to marketing procedure. Because of the necessary intensive work of the parent body along purely technical lines the sections offer a real opportunity to give consideration to some of the related activities in the industry.

On October 19, 1935, the Ohio Section received its charter from the Technical Association. It was presented by President Heritage at the Manchester Hotel, Middletown, Ohio.

A group of members located in Northern New York have been holding meetings and will probably apply for a charter some time this year.

During 1935 the following were elected officers of the Pacific Section: W. R. Barber, Crown Willamette Paper Company, Chairman; Carl Fahlstrom, Longview Fibre Company, vice chairman; and Earl G. Thompson, Pennsylvania Salt Manufacturing Company, secretary-treasurer.

The Lake States Section is still a top-notch section. The officers are: S. D. Wells, Combined Locks Paper Company, chairman; J. R. Fanselow, Kimberly-Clark Corporation, vice chairman; and H. W. Morgan, Institute of Paper Chemistry, secretary-treasurer.

The Kalamazoo Valley Section has been holding some extremely interesting and well attended meetings and has attracted to its meetings a large number of paper makers such as machine tenders and beater room foremen. This is an excellent accomplishment and worthy of trial by other sections. The officers in 1935 were: H. M. Annis, Allied Paper Mills, chairman; F. D. Libby, Kalamazoo Vegetable Parchment Company, vice chairman; and W. F. Hathaway, Kalamazoo Vegetable Parchment Company, secretary-treasurer.

The Delaware Valley Section is always well supported by interested members. The section has been unusually successful in obtaining speakers who have given members new points of view. The officers were: H. P. Cannon, Container Corporation of America, chairman; H. C. Schwalbe, Dill & Collins, Inc., vice chairman; and C. M. Connor, Valley Forge Laboratories, secretary-treasurer.

The New England Section holds meetings regularly each month. Its joint meeting with the Superintendents at the Toy Town Tavern, Winchenden, Mass., was a real highlight for the year. Its officers were: Frederic C. Clark, Skinner & Sherman, Inc., chairman; H. M. Keating, Smith Paper Company, vice chairman; Helen U. Kiely, American Writing Paper Company, secretary; and W. O. Johnson, Strathmore Paper Company, treasurer.

The Ohio Section received its charter in October, 1935, and the following officers were elected: Vincent F. Waters, Wrenn Paper Company, chairman; J. J. O'Connor, Mead Corporation and H. H. Latimer, Beckett Paper Company, vice chairman; C. D. Roess, Wrenn Paper Company, secretary-treasurer.

The Northern New York TAPPI Group have the following provisional officers: John Schuber, chairman; C. E. Libby, N. Y. S. College of Forestry, vice chairman; E. P. McGinn, St. Regis Paper Company, secretary-treasurer.

### Divisions and Committees

The past year has seen a marked improvement in the activities of most of the committees. This has reflected itself in the quality of papers presented at meetings and in the various committee projects that are receiving attention and which will soon lead to the preparation of material for the TAPPI Standards.

This part of the report will deal primarily with personnel changes. Details regarding the committee activities will be found in the various committee reports.

The Management Division has been undergoing considerable reorganization under the direction of W. M. Shoemaker, National Vulcanized Fibre Company, chairman. Paul Koenig of the P. H. Glatfelter Company was appointed vice chairman of the Division.

The Education Committee was discontinued and replaced by the Personnel Management Committee of which H. G. Noyes, Oxford Paper Company is chairman, and L. J. McNamara, Wisconsin Vocational School is vice chairman.

The History and Biography Committee was transferred to the Research and Development Division and B. T. McBain of Portland, Oregon, was appointed chairman to succeed R. S. Kellogg of the News Print Service Bureau.

The Management Methods Committee was discontinued and replaced by the Production Methods Committee. No personnel has been appointed.

In the Patents Committee, Joseph Rossman of the Marathon Paper Mills, replaced H. W. Richter of the G. O. Jenkins Company as vice chairman.

Two new committees are being considered, namely: A Finance and Economics Committee and a Marketing Methods Committee. No personnel has been appointed.

There were no changes in any of the committees of the Engineering Division.

In the Raw Materials Committee, John Traquair, Mead Corporation, was appointed general chairman to succeed John L. Parsons of the Hammermill Paper Company.

C. W. Boyce, American Paper and Pulp Association was appointed chairman of the Fibrous Raw Materials Committee to succeed Miss H. U. Kiely, American Writing Paper Company.

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J. A. Lee, Chemical and Metallurgical Engineering was appointed chairman of the Non-Fibrous Raw Materials Committee to succeed C. E. Peterson of the Riegel Paper Corporation.

In the Operating Division, George D. Bearce of the Maine Seaboard Paper Company, was appointed chairman of the Preparation of Fibrous Materials Committee to succeed F. W. Motschman of the International Paper Company.

W. H. Swanson, Kimberly-Clark Corporation was appointed chairman of the Acid Pulping Committee succeeding P. A. Paulson of Neenah, Wisconsin.

In the Alkaline Pulping Committee four vice chairmen were appointed, namely: W. F. Gillespie, Bogalusa Paper Company; R. H. Stevens, Sorg Paper Company; G. H. Tomlinson, Howard Smith Paper Mills; and W. T. Webster, J. O. Ross Engineering Company.

In the Stuff Preparation Committee, G. Lamont Bidwell, Jr., Riegel Paper Corporation was appointed to succeed D. Manson Sutherland, Jr. as chairman.

In the Paper Manufacture Committee, H. H. Latimer, Beckett Paper Company replaces Donald Appleton, Champion-International Paper Company, and Alfred Suter of Bogalusa Paper Company replaces R. A. Wilkins of Bird & Sons, as vice chairman.

V. F. Waters, Wrenn Paper Company, replaces Leopold Werdern, Peninsular Paper Company.

In the Research and Development Division, R. H. Doughty, Fitchburg Paper Company replaces P. K. Baird, Forest Products Laboratory as chairman.

In the Testing Division, W. O. Hisey, N. Y. S. College of Forestry replaces R. H. Wiles, International Paper Company, as vice chairman.

C. E. Peterson, Riegel Paper Corporation replaces W. A. Chapman as chairman of the Non-Fibrous Materials Testing Committee.

The chairmen of the divisions, committees and sections together with the Executive Committee constitute an informal organization called the TAPPI Council. This group usually meets during conventions and discusses policies regarding the association plans relating to committee work.

A new plan whereby committee plans are definitely outlined in a project authorization has been in effect during the past year and has resulted in excellent accomplishments.

#### Educational Cooperation

A new general Committee on Educational Cooperation was organized to distribute association research funds. This committee is made up of the Divisional Chairmen and John L. Parsons of Hammermill Paper Company, is chairman.

Because there was an evident need for having special investigations made to assist committees in their projects, provision was made by the association whereby limited funds were made available to carry on such studies. During the year two grants were made. One of $1,000, was made to the Fundamental Research Committee to determine the existence and nature of fiber membranes and the other for $150 to study the results of treating pulp in various kinds of refiners. The first study is being made at the Institute of Paper Chemistry and the second at the University of Maine.

Because of the type of organization and personnel of the Technical Association, it is obvious that it can probably never become a static body. The growing breadth of leadership in the Executive Committee, and Divisions and Sections, the organization is fortunate in having available a great wealth of ideas. Each year finds many of these ideas put into effect and when they have become properly digested as the result of careful trial, they have become a definite part of TAPPI and in a large measure this accounts for the advance that is being made by the association and is being reflected by the increasing prestige of members in the industry.

## Technical Association Elects Officers

The officers of the Technical Association of the Pulp and Paper Industry for 1936 are:

President, G. N. Collins, Stevens & Thompson Paper Company; vice-president, W. R. Maull, Dill & Collins, Inc.; secretary-treasurer, R. G. Macdonald, 122 East 42 street, New York.

The members of the Executive Committee include: G. N. Collins, W. R. Maull, H. R. Murdock, Champion Fibre Company; W. A. Swanson, Kimberly-Clark Corporation; M. H. Teaze, Hardy S. Ferguson & Company; Roger C. Griffin, Arthur D. Little, Inc.; G. W. E. Nicholson, Southern Kraft Corporation; H. U. Kiely, American Writing Paper Company, Inc.; A. E. H. Fair, Alliance Paper Mills, Ltd.; W. J. Lawrence, Paper Makers Chemical Corporation; Albert Bankus, Crown Willamette Paper Company, and R. G. Macdonald.

## World Wood Pulp Statistics

"World wood pulp statistics" is a compilation of official data showing the relationship of the United States Pulp Industry to the world's production, consumption, imports and exports of wood pulp. It has been prepared by the United States Pulp Producers Association with the view to bringing together in one publication all the obtainable essential data on this basic industry and is presented in this form in the hope that it will prove of interest and value to the members of the association and to pulp and paper manufacturers generally throughout the United States.

This compilation of all the available data on the world's pulp production, consumption, imports and exports will prove invaluable to all pulp and paper manufacturers, to whom it is available at $2.00 per copy.

## Government Paper Awards

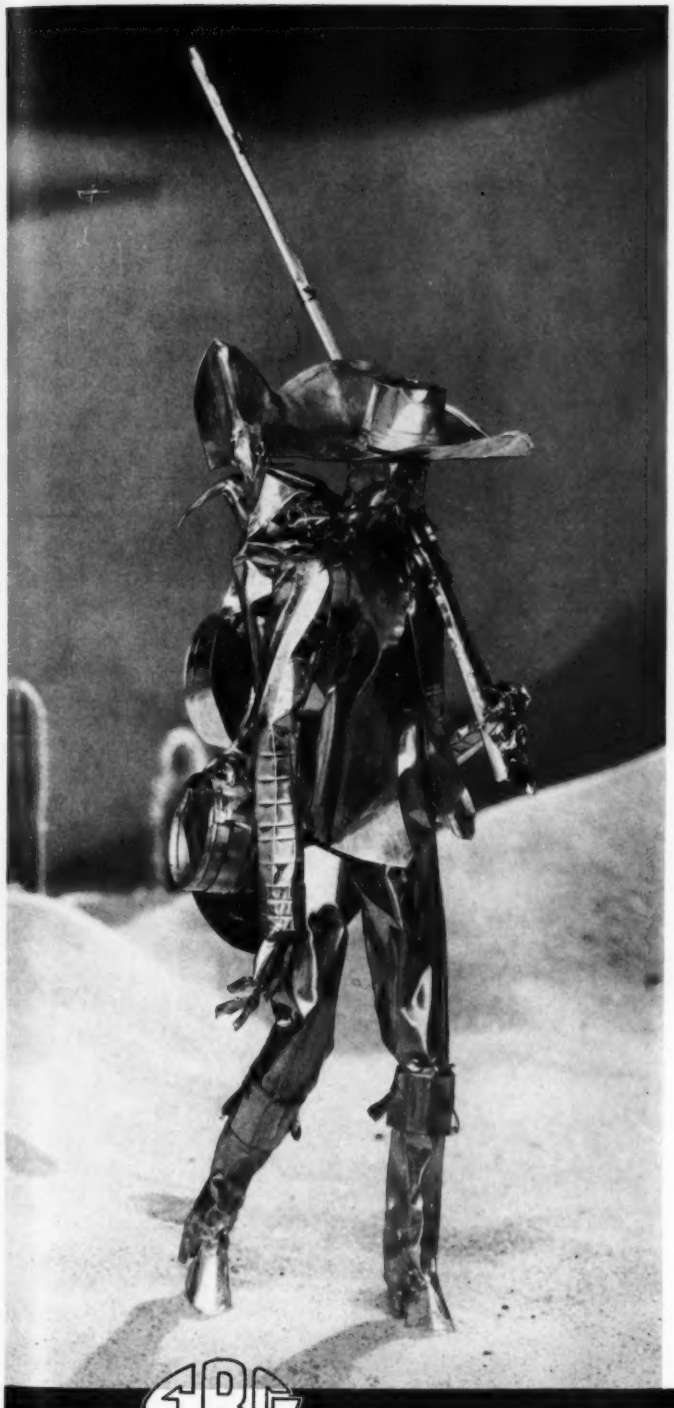
[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., February 19, 1936—The Whitaker Paper Company will furnish the Government Printing Office with 5,000 sheets of 22 x 28 red railroad board at $27.94 per M sheets. The same firm will also furnish 2,000 sheets of 24 x 36 brown cloth-lined paper at $140 per M sheets. Bids for both of these items were received on February 3.

Reese & Reese will furnish 734 pounds (2,000 sheets) of 30 x 33 red sulphite paper at 7.24 cents per pound and the R. P. Andrews Paper Company will furnish 2,000 sheets (80 pounds) of 20 x 24 red glazed paper at $9.60 per M sheets. Bids for these items were received on January 31.

## To Start Orange Mill in About Six Weeks

ORANGE, TEX., February 17, 1936—The Orange Pulp and Paper Corporation, which recently purchased the idle plant of the Commercial Pulp and Paper Company here and has been busy revamping the mill, expects to start operations in about six weeks. The mill has been thoroughly gone over and everything will be in first-class shape when the wheels are started. A first-class kraft bag sheet will be made.



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# Liquid Chlorine

FIRST IN THE COUNTRY

# The Nature and Measurement of Paper Acidity*

B. L. Browning[1] and R. W. K. Ulm[2]

**Abstract**

*The problems involved in determination of the acidity of paper are considered in the light of all available data. The TAPPI tentative standard method has been studied, with special reference to variations in the procedure involved. The nature of acidity of paper has been studied with regard to hydrolysis and acid formation during the water extraction, the effect of metal ions, and the nature of extracted material by potentiometric titration.*

Interest in acidity is directly related to the use requirements of paper. The effect of acidity on permanence of high grade papers has been amply demonstrated. For wrapping papers which are to be used in contact with metal surfaces, the acidity may cause rapid tarnishing or corrosion. Further, the rate of corrosion of type is related to the acidity of the printing paper on which it is used. Other deleterious effects of high acidity are noted from time to time.

The presence of acids in papers has been attributed to the following factors:

1. Acids derived from acid materials used in the preparation of the fiber material. These may be either residual cooking acids or hydrochloric acid arising from residual bleach.
2. Acid due to alum in the rosin size.
3. Acid due to treatment in finishing with acid substances; some glues, for example.
4. Acid due to alum in the tub size.
5. Acids due to degradation of the cellulose during aging and extraction.
6. Acid due to carboxyl groups of other carbohydrates present.

Strong acids such as sulphuric and hydrochloric acids may arise from 1, 2, and 4; others form weak acids. It is possible that the deleterious effects of acidity may be due only to the strong acids present. This must remain a matter of conjecture until more specific methods are developed for measuring the nature as well as the amount of the acidity present.

Two types of methods for determining the acidity of paper are in general use, the total acidity by titration and the measurement of the hydrogen ion concentration in the water extract. The relations of the effects measured by these two methods have not been well established. In addition, neither method actually measures the total acid present in the paper, since the amount of acid appearing in the extract depends upon the nature of the extraction process. There is also the possibility that acid not originally present as such in the paper may be formed under the conditions of extraction and subsequently appear in the water extract.

## Historical Discussion

### Total Acidity

As early as 1882, Feichtinger *(6)* reported that rosin-sized papers gave an acid reaction which he attributed to the presence of free sulphuric acid. Little progress in actual measurment was made for many years, except by Vandevelde *(21)* who suggested a twenty-four hour extraction in the cold, and subsequent titration of the filtered extract with standard barium hydroxide solution.

Upon investigation of this method in 1925 Kohler and Hall *(11)* found that with "double-sized" papers only the acidity due to the surface size was determined. This led them to distinguish between "external" acidity due to surface size and extractable in cold water, and "internal" acidity due to engine size and extractable only upon heating. The method of extraction worked out by them in the Swedish Government Testing Institute employs three successive extractions on a steam bath, and after cooling, titration of the extracts with 0.01 N alkali using phenolphthalein or iodoeosin as indicator.

Wehmer *(22)* described in detail the procedures for three methods: the A.S.T.M. method D 202-30 T, which employs a single extraction of five minutes' duration at boiling, the Kohler-Hall method already described, and the Rag Content Paper Manufacturers' Laboratory Method as suggested by Miss J. E. Minor, which employs a single extraction for two minutes at boiling.

Wehmhoff *(23)* compared methods of extraction and determined the effect of variables, such as presence of carbon dioxide, on the Kohler-Hall method, finding it to have little or no influence on the total acidity. It was further shown that the use of bromphenol blue (6 to 7.6 pH) gave considerably lower results than phenolphthalein (8.4 to 10 pH), but that the former was absolutely useless if the extract was even slightly yellow. Based mainly on the Kohler-Hall method as modified by the Bureau of Standards, the TAPPI tentative method, T 428 m was described *(18)*.

Clarke and Wooten *(2)*, using the quinhydrone electrode-N calomel electrode cell with a galvanometer as a null instrument for determining the end-point in the titration of the aqueous extract obtained by the A.S.T.M. method found that the indicator method might be greatly in error. The end-point indicated by such an arrangement as this is 7.03 pH at 25 deg. C, which is much nearer the theoretical end-point. This work is discussed by Schmidt *(14)*.

### Hydrogen-Ion Concentration of Paper Extract

The differentiation between the total acidity and the pH of paper was gradual. Taylor *(17)* mentioned it, saying, "It is only a question of a short time before many printers, etc., will include pH value as one of their specifications in the purchase of paper."

The first method for the determination of the pH value of the finished paper was described by Holwech *(10)*. The following year Hoffman *(9)* described a method using 5 grams of shredded paper in 250 cc. of water. Extraction was made for one hour by boiling, and after filtering and cooling, the pH values were determined potentiometrically, using a hydrogen electrode.

Schulze *(16)* used the same water-paper ratio, but heated only to 90 deg. C to reduce the possibility of degradation of the cellulose with acid formation. He examined the effect of varying the time of extraction, the effect of carbon dioxide in the extraction and measurement, and the effect of storage in air for 2.5 to 16.5 hour periods. pH measurements were made both in the presence and absence of fibers. All values fell within the range 4.65 to 5.25 pH. It was concluded that in this range special precautions to exclude carbon dioxide were unnecessary.

Wehmhoff *(23)* reported preliminary investigations carried out at the Bureau of Standards. One hour on a boiling water bath was found to be sufficient time for



* Presented at the Annual Meeting of the Technical Association of the Pulp and Paper Industry, Waldorf-Astoria Hotel, New York, N. Y., Feb. 17 to 20, 1936.
Submitted by the junior author as a thesis in partial fulfillment of the requirements of The Institute of Paper Chemistry for the degree of Master of Science from Lawrence College, Appleton, Wisconsin.

[1] Member TAPPI, Research Associate, The Institute of Paper Chemistry, Appleton, Wisconsin.
[2] Student, The Institute of Paper Chemistry, Appleton, Wisconsin.

extraction of most papers, which confirmed the work of Schulze. The comparison of the results of the use of super-pure water and ordinary distilled water indicated that the presence of carbon dioxide in the extracting liquid had the effect of depressing the pH values from 0.02 to 0.41 pH as determined by the quinhydrone electrode, but had no effect on the values determined colorimetrically. Isohydric indicator determinations agreed with the quinhydrone electrode closer than did non-isohydric indicators.

Following this with a progress report *(24)*, the same author reported results of a study of the water-paper ratio in extraction and the effect of using cut, rather than disintegrated paper. The results were inconsistent when low ratios were used, but when the ratio was increased to 100 to 1, a higher pH was found without exception. The pH values of the cut paper were lower than those of the disintegrated paper by 0.00 to 0.25 pH. Wehmer *(22)* described a rather complex method of extraction which included running a blank.

Based mainly on the work of Wehmhoff, the TAPPI tentative method *(19)* was evolved. This emphasized the standardization of the method of extraction rather than measurement of pH, which may be made either colorimetrically with adjusted indicators or potentiometrically with the hydrogen, quinhydrone, antimony, or glass electrodes. For colorimetric measurement, isohydric indicators are recommended, and for potentiometric, the glass electrode.

Using the glass electrode, Haug *(7)* examined the pH of aqueous extracts which were obtained under varying conditions of time and concentration and with samples of several different types of papers. On the basis of Kullgren's work *(12)*, which demonstrated the permutite reaction of cellulose fibers, Haug extracted with 0.1 N potassium chloride solution. The concentration of the potassium-ion in such a solution would be about 500 times as great as the hydrogen-ion concentration. In all cases, lower pH values were found with the potassium chloride extraction. It was concluded that this could not be a salt effect, as addition of a like amount of the salt to the aqueous extract produced no change whatsoever in the pH. Upon adding the fibers to this salt-treated extract, stirring for two minutes, filtering and remeasuring the pH value, the same value was found as with the straight 0.1 N salt extraction. From this it was concluded that because diffusion is a very slow process, all replaceable H-ions must be held on the surface of the fibers, since such a short extraction time was necessary. It was also concluded that the displacement equilibrium is satisfied almost instantaneously, and that the pH of the extract should be independent of the time of extraction. Then, since long exractions at the higher temperatures resulted in gradually decreasing pH values, H-ions must be formed spontaneously in the process of extraction. It was found that cold extractions showed a trend, if any, toward higher pH values upon longer extraction, and this was attributed to some coagulation of the fiber material rather than to any simple chemical process.

### Measurement of the Acidity of Paper Suspensions

Edge *(4)* has concluded that only two methods seem to be free from the uncertainties of extraction which are associated with methods of the Kohler-Hall type. One of these is the isohydric method, namely, the pH of the paper is defined as the pH of a buffer solution which does not change in pH upon the addition of paper. Haug *(7)* logically objects to this idea because there seems to be no reason to believe that the pH of the solid phase is the same as the pH of the liquid phase in such a system. For example, there is no reason to believe that two buffers of different pH values may not remain in equilibrium with one and the same paper, or two papers of different acidities be in equilibrium with one buffer solution, if the concentrations of the metallic ions present in such systems are different. When no change of pH occurs upon the addition of paper, it simply means that equilibrium conditions are satisfied.

The other method suggested by Edge is a potentiometric titration of a known weight of the paper, the fibers being kept present throughout the titration. In this method the paper is boiled two minutes at a 50 to 1 water-paper ratio, stirred mechanically for a half hour, and titrated with 0.02 N alkali. The titration curves are reproducible only if a specified time between each addition of alkali and the pH measurment is adhered to rigidly.

### White Water pH in Relation to the pH of the Finished Paper

Because of the increasing number of paper specifications which include an acidity or pH value, it has become quite desirable to find a method of predicting the pH of the finished paper from the measured pH at some location between the beater and the wire. Chase *(1)* attempted to supply this need by recommending the pH measurement of the white water after heating to boiling and cooling. It was reported that such treatment caused a fall in pH, and by use of indicators directly on the paper, a like fall was noted in the pH of the paper as it passed over the driers. More recently Minor and Blaisdell *(13)* showed that the pH of high purity papers does not change in passing over the driers, and further that there is no general relation between the pH of the heated white water and the pH of the finished paper.

## Objectives of the Investigation

The proposal of a TAPPI tentative standard method for the determination of hydrogen-ion concentration of paper extracts, and the possible wide application of such a method suggested a further study of analytical details of the method. This work was directed chiefly toward a study of certain variables in the extraction process.

The nature of the acidity present and the behavior of acids or acid-forming substances during the extraction of paper is of the utmost importance in interpretation of the analytical values obtained. A portion of the investigation was therefore directed toward the development of an understanding of the factors involved.

## Experimental Materials and Methods

### Extraction

The extractions were carried out in 500-cc. round bottom Pyrex flasks fitted to condensers with standard taper ground glass joints. When heated in a water bath, these were submerged to the neck in boiling water; for boiling temperatures they were heated directly over burners on asbestos center wire gauzes. Temperatures were measured by lowering a thermometer into the flasks through the condenser.

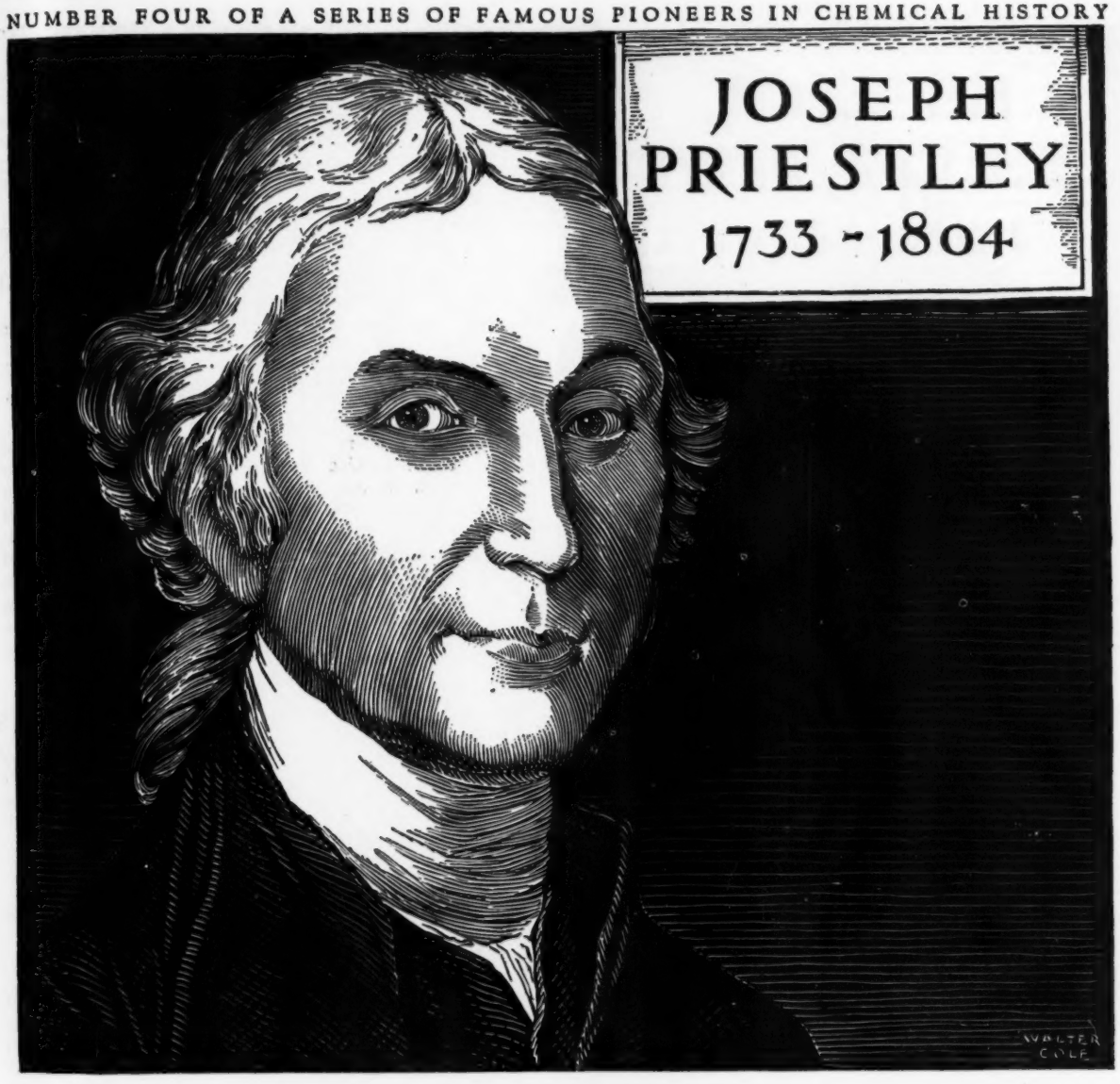
### Filtration and Cooling

In extractions for pH measurements, the filtration was made directly into lipless 150-cc. Pyrex beakers without suction through a Jena 1G1 fritted glass crucible. In extractions for titration, the filtration was made with suction directly into 400-cc. Pyrex beakers through Jena 2G1 fritted glass crucibles. The beakers were stoppered with rubber stoppers and cooled to room temperature in a water bath.

### Measurement of pH

The glass electrodes were either purchased (Leeds &

NUMBER FOUR OF A SERIES OF FAMOUS PIONEERS IN CHEMICAL HISTORY




TO JOSEPH PRIESTLEY, chemist-minister, belongs the distinction of discovering nine important gases, among which was ammonia. In the course of his experiments, Priestley established the fact that ammonia is composed of nitrogen and hydrogen gases. One hundred and fifty years later another pioneering venture in ammonia was launched at Niagara Falls when Mathieson started the operation of a synthetic ammonia plant which took nitrogen from the air and combined it with by-product hydrogen gas from the electrolytic alkali process. Produced by an organization already well-versed in the manufacture and handling of compressed gases, Mathieson Anhydrous Ammonia has from the beginning been noted for its purity and for the trouble-free container equipment in which it reaches the consumer.

*During an early experiment at his cottage near Leeds, England, Priestley is said to have driven his protesting family from the house with the pungent ammonia fumes he generated. Years later, political enemies incited a mob to burn down his house and laboratory near Birmingham. Priestley was barely able to save himself and his family. Soon after, he emigrated to America, where he died nine years later at the age of 71.*

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Northrup 7685P-1) or blown from Corning 015 glass. All were of the immersion bulb type filled with hydrochloric acid of 1 pH. The internal electrode was Leeds and Northrup 7685P-2 for use with quinhydrone. A Hilderbrand type saturated calomel reference cell made up with Eppley specially purified chemicals was used. The glass electrode, a gold wire electrode, the side arm from the calomel half-cell, a thermometer, and a tube for the introduction of nitrogen were mounted in a rubber stopper of size sufficient to fit a 150-cc. beaker. Both the upper and lower surfaces of the stopper were coated with a benzol solution of paraffin.

The potentials of both the glass-calomel cell and the gold (quinhydrone)–calomel cell were measured by the use of a Goodhue-DeWitt vacuum tube amplifier and a Leeds and Northrup student type potentiometer.

### Titration Apparatus

The glass electrode, the side arm from the calomel half-cell, a thermometer, and a tube of sufficient length to reach to the bottom of a 400-cc. beaker for the introduction of nitrogen were mounted in a rubber stopper of size to fit a 400-cc. beaker. A fifth hole was bored in the stopper for the entrance of the extended tip of an automatic alkali burette.

### Papers

The papers used were chosen for their pH values rather than for the nature of the fibers and sizing. It was desired to cover the range of pH usually encountered in the field of bond papers. The papers selected were all high grade bonds with both engine and tub sizing. They were:

*Paper G*—An antique finish all purified sulphite bond, tub sized with starch. pH approximately 4.7.
*Paper A*—A plate finish all purified sulphite bond, tub sized with glue, pH approximately 5.2.
*Paper N*—A 50 per cent rag content bond, engine sized with a protein rosin size and tub sized with starch. pH approximately 6.0.

The papers were cut to ¼ x ⅜ inch strips or disintegrated in the Gosta-Hall disintegrator, and stored in sealed mason jars until desired for use.

### Standard Method of Extraction

The following is the method of extraction defined in the TAPPI tentative Standard method for the pH of paper *(19)*. 5 grams of air-dry disintegrated paper, weighed to to the nearest 0.1 gram, are placed in a 500-cc. extraction flask and 250 cc. of boiling distilled water are added in portions to facilitate wetting of the paper. The flask is fitted with a condenser and extraction is continued for one hour on a water bath which will maintain the contents of the flask at 95 to 100 deg. C. without boiling the water. The contents are then filtered hot, twice through a Büchner funnel with strong suction. The filtrate is cooled in well stoppered flasks.

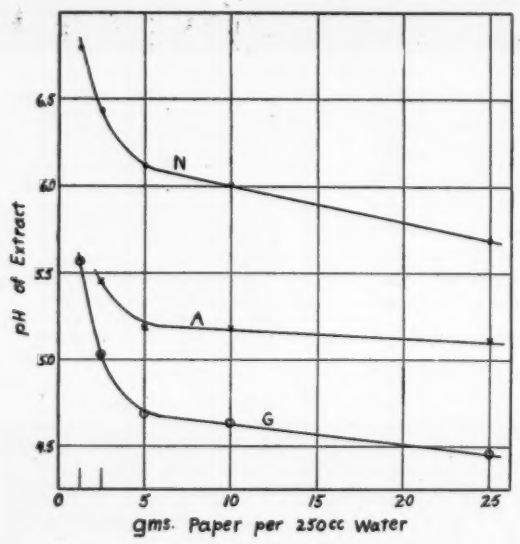


FIG. 1
Effect of water-paper ratio on pH of extract.

In this work the standard method of extraction was slightly modified in the following respects:

a. The amounts of paper and water were both decreased one half in order to conserve materials.
b. The paper samples were used both cut into squares and disintegrated.
c. Filtration was made in Jena glass crucibles to minimize handling of the extract and to avoid the necessity for refiltration.

The pH of the extract was measured with both glass and quinhydrone electrodes after sweeping the surface of the beaker with a stream of nitrogen from a cylinder. The nitrogen was freed from possible content of carbon dioxide by passing the gas through a tube containing ascarite. After the glass electrode measurements, the beaker was removed and 1 cc. of a saturated solution of quinhydrone in acetone added.[3] After stirring, the beaker was replaced and the measurement of the pH repeated with the gold electrode. Duplicate extractions were run in all cases.

### Calibration of the Glass Electrode

The glass electrode was calibrated daily with 0.05 N potassium acid phthalate. The phthalate solution was prepared fresh once a week from a 0.20 N solution which according to Schollenberger (Lange) *(15)* is quite stable while the weaker solution deteriorates in a few days. The electrode was also calibrated at intervals against MacIlvaine's buffer of 8.0 pH.

## Experimental Results and Discussion

### A. Study of TAPPI Tentative Method for pH of Water Extract of Paper

#### *Water-Paper Ratio*

The standard extraction was modified to use 0.625, 1.250, 2.500, 5.00, and 12.50 grams of paper to 125 cc. of water. The results are tabulated in Table I and shown graphically in Fig. 1. (The glass electrode values, if available, are plotted in all diagrams.) The maximum variation of the measured pH is ± 0.02 pH for a variation of ± 0.1 gram in 5 grams (± 2 per cent of the amount weighed).

TABLE I
EFFECT OF WATER-PAPER RATIO IN EXTRACTION ON pH OF EXTRACT
(Cut Sample)

| | | | | | |
|---|---|---|---|---|---|
| Grams paper in 125 cc. water. | 0.625 | 1.250 | 2.500 | 5.00 | 12.50 |
| Grams paper in 250 cc. water. | 1.250 | 2.500 | 5.000 | 10.00 | 25.00 |
| Water-paper ratio | *200–1* | *100–1* | *50–1* | *25–1* | *10–1* |
| **PAPER G** | | | | | |
| Glass electrode | .... | .... | 4.69 | 4.62 | 4.46 |
| Quinhydrone | 5.57 | 5.03 | 4.69 | 4.64 | 4.46 |
| **PAPER A** | | | | | |
| Glass electrode | .... | .... | 5.19 | 5.18 | 5.11 |
| Quinhydrone | .... | 5.45 | 5.20 | 5.21 | 5.16 |
| **PAPER N** | | | | | |
| Glass electrode | 6.80 | 6.44 | 6.12 | 6.01 | 5.69 |
| Quinhydrone | 6.41 | 6.11 | 5.99 | 5.93 | 5.68 |

#### *Time of Extraction*

The time of the standard extraction was varied through 10 minutes, 30 minutes, 60 minutes, and 120 minutes.

With the standard extraction temperature modified to

[3] Coons*(3)* states that 7 mg. (4 drops of a strong acetone solution) of quinhydrone in 100 cc. are sufficient for an accuracy of 0.05 pH. The amount actually used in this case is several times this.

The Bell System now extends to all day Sunday the same reduced rates which have been in effect on long distance station-to-station calls after 7 p.m. each evening. The reductions apply to most calls on which the day rate for three minutes is more than 35 cents, and range from about 10 per cent on some of the shorter calls to 40 per cent or more on distant calls.

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|---|---|---|---|---|---|---|
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| New York to Philadelphia | $ .50 | $ .35 | $ .15 | $ .75 | $ .60 | $ .15 |
| Pittsburgh to Cleveland | .70 | .40 | .30 | 1.00 | .70 | .30 |
| Chicago to Cincinnati | 1.20 | .70 | .50 | 1.60 | 1.10 | .50 |
| St. Louis to Chicago | 1.25 | .75 | .50 | 1.65 | 1.15 | .50 |
| Detroit to Boston | 2.55 | 1.40 | 1.15 | 3.25 | 2.10 | 1.15 |
| Washington, D.C., to Kansas City | 3.50 | 1.90 | 1.60 | 4.50 | 2.90 | 1.60 |
| Miami to Boston | 4.50 | 2.50 | 2.00 | 5.75 | 3.75 | 2.00 |
| Denver to New York | 6.00 | 3.50 | 2.50 | 7.50 | 5.00 | 2.50 |
| Washington, D.C., to San Francisco | 8.50 | 5.00 | 3.50 | 10.75 | 7.25 | 3.50 |

room temperature, the time was varied through 1 hour, 2 hours, 5 hours, and 24 hours.

The results are given in Table II and Fig. 2. In the hot extractions, exact adherence to the specified time is not important, provided it is at least one hour. The extractions at room temperature do not support the contention of Haug *(7)* who maintains that they should be independent of time.

TABLE II
EFFECT OF TIME OF EXTRACTION ON pH OF EXTRACT
(Cut Sample)

PART A: EXTRACTION IN BOILING WATER BATH

| | 10 min. | 30 min. | 60 min. | 120 min. |
|---|---|---|---|---|
| PAPER G | | | | |
| Glass electrode | 5.17 | 4.94 | 4.69 | 4.71 |
| Quinhydrone | 5.11 | 4.89 | 4.69 | 4.72 |
| PAPER A | | | | |
| Glass electrode | 5.91 | 5.35 | 5.19 | 5.08 |
| Quinhydrone | 5 82 | 5.34 | 5.20 | 5.15 |
| PAPER N | | | | |
| Glass electrode | ... | ... | 6.12 | 6.04 |
| Quinhydrone | 6.63 | 6.23 | 5.99 | 6.03 |

PART B: EXTRACTION AT ROOM TEMPERATURE

| | 1 hour | 2 hours | 5 hours | 24 hours |
|---|---|---|---|---|
| PAPER G | | | | |
| Glass electrode | 6.13 | ... | 6.38 | 5.97 |
| Quinhydrone | 6.22 | 6.03 | 6.00 | 5.86 |
| PAPER A | | | | |
| Glass electrode | 6.32 | ... | 6.43 | 6.23 |
| Quinhydrone | 6.33 | 6.31 | 6.10 | 6.20 |
| PAPER N | | | | |
| Glass electrode | 6.84 | 6.75 | 6.67 | 6.65 |
| Quinhydrone | 6.60 | 6.51 | 6.42 | 6.47 |

*Temperature of Extraction*

Extraction was modified to occur in water baths of the following temperatures: 20, 50, 80, 95 degrees, and with a direct boiling of the extraction medium. Both cut and disintegrated samples were used.

The results are tabulated in Tables III and IV and shown graphically in Fig. 3. From the slope of the curves it is evident that a variation of +5 degrees at 95 degrees gives rise to a fall of approximately 0.1 pH in the extract. The need for more exact specifications of extraction temperature is shown, and the temperature should be controlled to a standard value ±1 deg. C.

*Carbon Dioxide in the Water Used for Extraction*

The standard extraction was modified by the use of redistilled water and of water saturated at room temperature with carbon dioxide, in place of the ordinary distilled water. The redistilled water was prepared by passing carbon dioxide free air through boiling distilled water for 3 hours, then redistilling in a carbon dioxide free atmosphere through all pyrex glass apparatus into a glass stoppered pyrex bottle.

Quinhydrone values only were obtained and are given in Table V. These results seem to obviate the necessity for use of redistilled water in extractions within this pH range. The importance of carbon dioxide appears to have

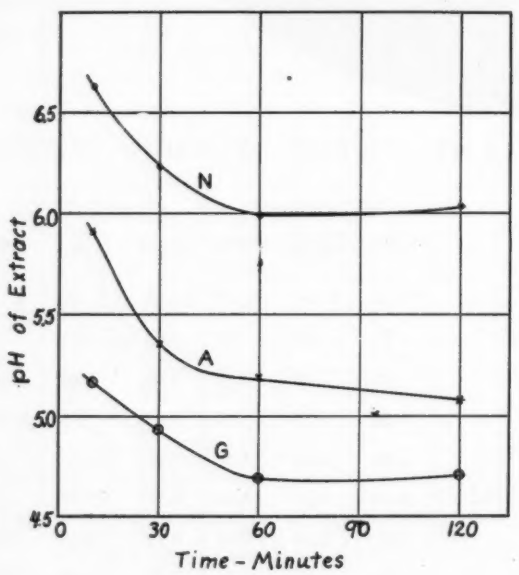


FIG. 2
Effect of time of extraction on pH of extract. (Extraction on boiling water bath).

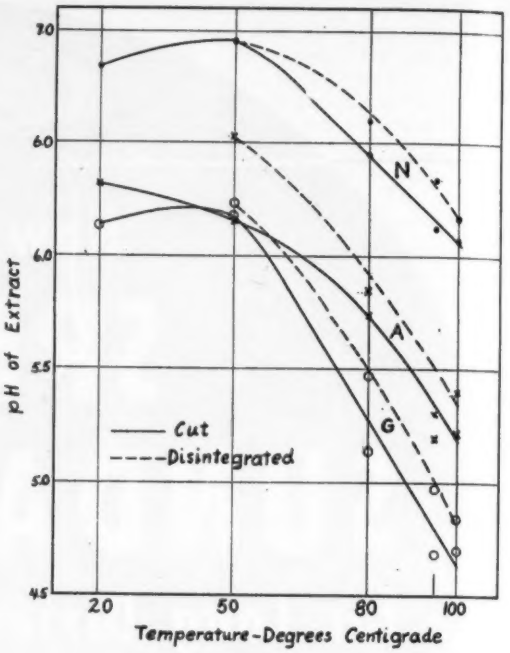


FIG. 3
Effect of extraction temperature on pH of extract.

TABLE III
EFFECT OF TEMPERATURE OF EXTRACTION ON pH OF EXTRACT
(Cut Sample)

| | 20 deg. C. | 50 deg. C. | 80 deg. C. | 95 deg. C. | 100 deg. C. |
|---|---|---|---|---|---|
| PAPER G | | | | | |
| Glass electrode.. | 6.13 | 6.17 | 5.14 | 4.69 | 4.70 |
| Quinhydrone ... | 6.22 | 5.90 | 5.16 | 4.69 | 4.68 |
| PAPER A | | | | | |
| Glass electrode.. | 6.32 | ... | 5.74 | 5.19 | 5.21 |
| Quinhydrone ... | 6.33 | 6.15 | 5.68 | 5.20 | 5.18 |
| PAPER N | | | | | |
| Glass electrode.. | 6.84 | 6.96 | 6.45 | 6.12 | 6.07 |
| Quinhydrone ... | 6.60 | 6.71 | 6.28 | 5.99 | 5.81 |

TABLE IV
EFFECT OF TEMPERATURE OF EXTRACTION ON pH OF EXTRACT

PART A: DISINTEGRATED SAMPLE, STOCK PRESENT DURING pH MEASUREMENT

| | 50 deg. C. | 80 deg. C. | 95 deg. C. | 99 deg. C. |
|---|---|---|---|---|
| PAPER G | | | | |
| Glass electrode | 5.95 | 5.23 | 4.70 | ... |
| Quinhydrone | 5.76 | 5.22 | 4.66 | ... |
| PAPER A | | | | |
| Glass electrode | 6.29 | ... | 5.31 | ... |
| Quinhydrone | 6.15 | ... | 5.35 | ... |
| PAPER N | | | | |
| Glass electrode | 7.12 | ... | 5.69 | ... |
| Quinhydrone | 6.89 | ... | 5.63 | ... |

PART B: DISINTEGRATED SAMPLE, FILTERED BEFORE pH MEASUREMENT

| | | | | |
|---|---|---|---|---|
| PAPER G | | | | |
| Glass electrode | 6.23 | 5.47 | ... | 4.84 |
| Quinhydrone | 6.05 | 5.40 | 4.97 | 4.83 |
| PAPER A | | | | |
| Glass electrode | 6.53 | 5.84 | 5.30 | 5.40 |
| Quinhydrone | 6.30 | 5.77 | 5.29 | 5.37 |
| PAPER N | | | | |
| Glass electrode | 6.95 | 6.60 | 6.34 | 6.17 |
| Quinhydrone | 6.74 | 6.39 | 6.21 | 5.99 |

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**2. *WATER***

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**3. *WASTE LIQUOR DISPOSAL***

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**4. *LABOR***

Ample supply of dependable labor available.

**5. *POWER***

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**6. *TRANSPORTATION***

Willapa Harbor provides a wide and deep channel, affording ample passage for any ship. Vessels from all parts of the world call at this port. The harbor is also served by two transcontinental railroads—the Chicago, Milwaukee, St. Paul and Pacific, and the Northern Pacific—affording competitive freight rates East, and is also served by excellent arterial highways.

**7. *MARKETS***

Willapa Harbor is so located as to participate competitively in all markets of the world.

**8. *CLIMATE***

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**9. *TAXES***

Comparatively low taxes.

**10. *VIRGIN TERRITORY***

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**11. *LOCAL CAPITAL***

Local interests would be willing to supply some capital, if desired, for the construction of a pulp mill.

**12. *CO-OPERATION***

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been over-estimated. Even in water saturated with carbon dioxide, most of the carbon dioxide is boiled out and lost during the extraction.

TABLE V
EFFECT OF CARBON DIOXIDE IN WATER ON pH OF EXTRACT

| Paper: | G | A | N |
|---|---|---|---|
| Redistilled water | 4.71 | 5.20 | 5.90 |
| Ordinary distilled water | 4.69 | 5.20 | 5.99 |
| Distilled water saturated with $CO_2$ | 4.54 | 4.99 | 5.60 |

*Effect of Carbon Dioxide during Cooling of Water Extract*

The standard extraction was made using 5.00 grams of paper and 250 cc. of water. Upon filtration, each extract was divided into two portions in beakers, one being cooled stoppered according to the standard method, and the other unstoppered.

This was repeated with the omission of filtration. The results are given in Table VI. Absorption of atmospheric carbon dioxide during cooling is very slow and apparently leads to no appreciable error in uncovered beakers at 6 pH and below.

TABLE VI
EFFECT OF CARBON DIOXIDE DURING COOLING OF WATER EXTRACT
(All Values from Quinhydrone Readings)

| | Filtered | | Unfiltered | |
|---|---|---|---|---|
| Paper Sample | Stoppered | Unstoppered | Stoppered | Unstoppered |
| G cut | 4.67 | 4.66 | ... | ... |
| G cut | 4.61 | 4.61 | ... | ... |
| G cut | 4.66 | 4.66 | ... | ... |
| A cut | 5.07 | 5.06 | ... | ... |
| A cut | 5.18 | 5.18 | ... | ... |
| N cut | 5.54 | 5.54 | ... | ... |
| N cut | 5.50 | 5.48 | ... | ... |
| G disintegrated | ... | 4.62 | 4.68 | 4.70 |
| A disintegrated | ... | 5.35 | 5.36 | 5.38 |
| N disintegrated | ... | 6.07 | 6.02 | 6.09 |

*Time of Standing After Extraction*

Standard extractions of two papers were made. After measurement of the pH with the glass electrode only, the extracts were allowed to stand in the beakers stoppered as while cooling. Further pH measurements were made at the end of 24, 72, and 96 hours.

An extraction of paper N was made according to the standard method modified by omission of filtration. A pH measurement was made upon cooling, with the glass electrode only, and the suspension was allowed to stand unstoppered in the laboratory for further pH measurements.

These results are tabulated in Table VII. A slow increase in pH with long standing is noted. This may be caused by a slow reversal of the alum hydrolysis to be discussed below.

TABLE VII
TIME OF STANDING AFTER EXTRACTION ON pH OF EXTRACT
(All Values by the Glass Electrode)

| Stoppered in Pyrex Beakers | Paper G | Paper N |
|---|---|---|
| Immediately after cooling | 4.83 | 5.86 |
| After standing 24 hours | 4.95 | 5.92 |
| After standing 72 hours | 5.03 | 5.93 |
| After standing 96 hours | ... | 6.03 |

| Unstoppered in Pyrex Beakers | Paper N (Fibers Present) |
|---|---|
| Immediately after cooling | 5.94 |
| After 1 hour standing | 5.96 |
| After 3 hours standing | 6.04 |
| After 24 hours standing | 6.09 |

*Preparation of Sample*

Two general methods of preparation of the paper sample have been used; the paper may be cut into small squares or strips, or shredded in a disintegrator of the Gosta-Hall type.

Previous investigators have observed that extraction of the cut paper gives the lower pH values. This is confirmed in the work here reported. (See Tables III and IV). The most reasonable explanation of this effect appears to be in the more even wetting of the cut samples. Especially in the case of well sized papers, the disintegrated paper is very difficult to wet uniformly and in many extractions it may be seriously questioned whether complete wetting has occurred even at the end of the one hour extraction period.

In view of the fact that more uniform results appear to be obtained with cut samples, that appreciable differences in pH do exist in the pH of the extract obtained, and that not all laboratories are equipped with a disintegrator, it appears more desirable that the paper be prepared for extraction by cutting.

*Presence of Fibers during pH Measurement*

In a number of determinations made in the course of this work, pH measurements were made with the paper fibers still in the extraction medium, and after filtering out the fibers. The results are listed elsewhere and will not be repeated here. The presence of the fibers causes an apparent decrease in pH averaging 0.2.

*Discussion*

The variation in the water-paper ratio permitted in the TAPPI tentative standard method, that is, 5 grams paper to the nearest 0.1 gm. is satisfactory. A variation of ±0.1 gram in the sample or of ±5 cc. in 250 cc. of water (± 2 per cent.) causes a variation in the measured pH of 0.02 pH or less.

The time of extraction specified is one hour with no permissible limits. Much less than one hour is insufficient, while a maximum of 0.11 pH difference was noted between 1 and 2 hour extractions. The specification of an extraction time of one hour ±5 minutes is suggested as a reasonable limit.

An allowable temperature variation of 95 to 100 deg. C. is too great, since deviations of as much as 0.2 pH may result. A maximum variation of ± 1 deg. C. should be permitted, for example 99 ± 1 deg. C.

Any carbon dioxide which may be present in distilled water of 6 to 6.5 pH or which may be introduced by exposure of the extract to the atmosphere while cooling, does not lead to significant errors with papers of 6 pH or below. The specification of distilled water of unusual purity and of a pH approximately 7 is therefore unnecessary in the measurement of most papers to which the method will be applied. It is suggested that the method be altered to permit the use of distilled water of 6 to 7 pH without further purification unless the paper extract is known or found to have a pH above 6.0.

The stoppering of the extract during cooling is a wise precaution, but no unusual care is required in avoiding exposure of the extract to the atmosphere. The time of standing of the extract before measurement of pH is not important for short periods. The measurement should be made during the same day as the extraction and the extract not allowed to stand overnight. A slow rise in pH takes place which may amount to more than 0.1 pH.

Because of the more even wetting of cut samples of paper, it is suggested that samples be prepared for extractions by cutting into squares or into strips not more than ¼ inch wide.

B. Studies On the Nature of Acidity in Paper

*Statement of the Problem*

In view of the importance of acidity in the use requirements of paper, a basic understanding of the nature of such acidity and its effects on the use of paper is very desirable. Fundamental in this consideration are:

a. The constituents responsible for the acidity of paper.
b. Means for measurement of the relative amounts of these constituents.
c. The relative effects of these constituents on the use requirements of paper.

The relative effects of the different acid constituents in paper have not been accurately determined. Any comprehensive study of the matter is impossible until all the acid

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forming substances present can be determined and means for their separate estimation developed.

The present work was undertaken in the hope of learning something of the nature of the acids present in paper and of their relative effects in determining the acidity of the water extract.

*Effects of Repeated Extractions*

It is well known from the work of Kohler and Hall and others on the total acidity of paper extracts that further but decreasing amounts of acids are obtained in successive water extracts. The pH values of successive extracts for two of the papers investigated have been determined, and are given in Table VIII and Fig. 4.

TABLE VIII
pH VALUES OF SUCCESSIVE WATER EXTRACTS
(Glass Electrode)

| Paper Sample | Preparation | pH of Extract First | Second | Third | Fourth |
|---|---|---|---|---|---|
| G | Cut | 4.58 | 4.84 | 5.11 | 5.08 |
| G | Disintegrated | 4.69 | 4.86 | 5.10 | 5.05 |
| A | Disintegrated | 5.32 | 5.49 | 5.68 | 5.85 |

The total acidity of successive extracts drops quite rapidly, so that no more than the first three extracts have been generally used for titration. However, the pH value of the successive extracts rises very slowly. This is surprising if the acids removed are due to alum which dissolves in the extract. This point will be further discussed in a later section.

*Effect of Salts in the Extraction by Water*

The experiments of Haug already described in replacement of hydrogen ions by positive metal ions offer a means of studying the nature of paper acidity. If Haug's assumptions are correct, then almost complete replacement of adsorbed hydrogen ions should be obtained. Further, the results may give an insight into the effect of smaller quantities of other salts such as $Na_2SO_4$ which are present in paper. It seemed worthwhile therefore to apply his technique to our own paper samples on which considerable data were already available.

With this in mind the following experiments were made:

a. After a standard extraction using 5.00 grams of paper and 250 cc. of water, the filtered extract was divided into two portions. After first measuring the pH with the quinhydrone electrode, enough of a concentrated solution of potassium chloride and of potassium sulphate were added to respective portions to make the resulting solution 0.1 N in the salt. The pH was again measured after 2 minutes. Half of the original extracted paper was now placed in each solution, the mixture stirred, allowed to stand for 5 minutes, filtered, and the pH remeasured.
b. Standard extraction with 0.1 N solutions of these salts in place of the water.

The results are given in Table IX.

TABLE IX
EFFECT OF SALTS IN EXTRACTION OF PAPER

| | G | A | N |
|---|---|---|---|
| Water extract | 4.66 | 5.07 | 5.54 |
| Extract + KCl | 4.68 | 5.14 | 5.54 |
| Extract + KCl + Fibers[1] | 4.58 | 5.15 | 5.52 |
| KCl extract | 4.49 | 4.90 | 5.20 |
| Water extract | 4.66 | 5.07 | 5.54 |
| Extract + $K_2SO_4$ | 4.82 | 5.12 | 5.54 |
| Extract + $K_2SO_4$ + Fibers[1] | 4.65 | 5.13 | 5.49 |
| $K_2SO_4$ extract | 4.55 | 5.15 | 5.15 |

[1] The fibers were still in the form of the original paper. A cut sample was used and this was not disintegrated by the extraction.

It will be noted that the conception of an instantaneous displacement equilibrium is not confirmed. If it were, the pH value of the extract, salt and fiber should be the same as the straight salt extraction value. This is also in agreement with the rate of extraction in showing the slow attainment of equilibrium.

Actually but little difference is obtained even with the straight salt extraction, showing no appreciable replacement of hydrogen ions. Therefore, if hydrogen ions are adsorbed and replaced from the fibers by the permutite reaction, it must be concluded that only a small portion of paper acidity can be ascribed to such adsorbed ions.

The experiments on successive extractions were now repeated with the use of 0.1N salts as the extracting medium. If the increase in acidity of the first extract due to the presence of the salt is caused by replacement of any considerable proportion of the hydrogen ions on the surface of the fiber, then the acidity of successive salt extracts should decrease more rapidly than the acidity of successive water extracts. Actually, no such trend is obtained. This again is evidence that no considerable ionic replacement on the fibers occurs.

The successive extraction data are given in Table X and included with the water extraction data in Fig. 4.

TABLE X
pH VALUES OF SUCCESSIVE 0.1 N KCl EXTRACTS

| Paper Sample | Preparation | Electrode | pH of Extract First | Second | Third | Fourth |
|---|---|---|---|---|---|---|
| G | Cut | Quinhydrone | 4.49 | 4.52 | 4.62 | 4.66 |
| G | Disintegrated | Glass | 4.29 | 4.43 | 4.67 | ... |
| A | Disintegrated | Glass | 5.00 | 4.90 | 5.11 | ... |

*Potentiometric Titration of Water Extracts of Paper*

The pH of the water extract of paper gives little indication as to the nature of acids present; much more information can be obtained by potentiometric titration of the extracts. Strong acids exhibit a rapid change in pH with addition of reagent at the equivalence point while weak acids exhibit a buffer action during the titration and give a much smaller inflection at the equivalence point. This method was therefore applied to the extracts of papers already available.

*Experimental Details*

The TAPPI Standard T 428 m, slightly modified as described below, was adopted in this work.

5.00 grams of disintegrated air-dry paper were extracted by adding 250 cc. of boiling distilled water and heating for one hour on a boiling water bath as in the standard pH extraction. The suspension was filtered on a Jena 2G1 crucible, the fibers remaining in the flask being washed onto the filter by returning the filtrate to the flask and refiltering, using a medium suction. The flask and fibers were washed with 10 cc. boiling distilled water, drained for 15 seconds and the fibers returned to the flask. 250 cc. fresh boiling distilled water were added and a second, third, and fourth extractions made in the same manner. The filtrate after cooling was titrated with 0.0054 N sodium hydroxide solution, the pH measurements being made as soon as the glass electrode came to equilibrium, usually about 30 seconds after the addition of the alkali. During the titration the solution was continually stirred by passing into the bottom of the beaker a stream of carbon dioxide-free nitrogen.

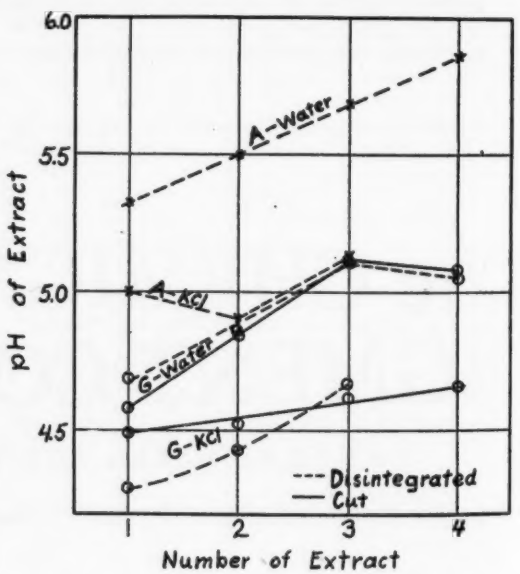
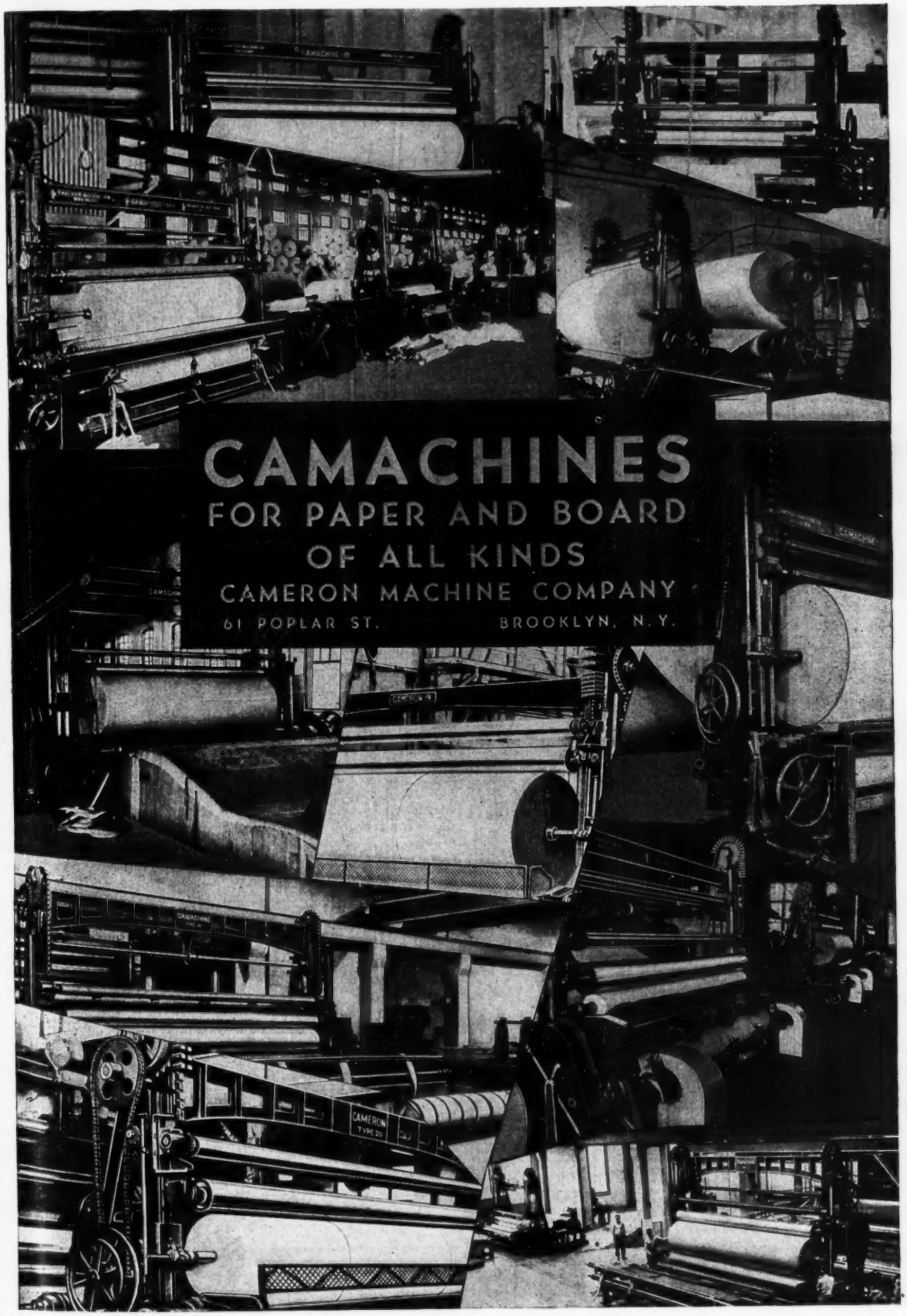



FIG. 4
pH of successive extracts of paper.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The above was repeated using 0.1N potassium chloride as the extracting medium instead of distilled water.

*Titration of Successive Extracts*

The titration curves obtained are shown in Figs. 5 and 6. In all cases the first titration curve lacks the sharp inflection shown by the curves of the subsequent extractions. This indicates not only that the first extraction contains weak acids or the salts of weak acids or basis which exert a buffer action during the titration, but that such substances are nearly or entirely removed in the first extract. The subsequent extractions have titration curves with the sharp inflection typical of strong acids.

The titration curves of the KCl extractions show the greater amount of total acid extracted, and also exhibit a much greater buffering effect on the acid side than the water extracts.

*Total Acidity as Determined by Potentiometric Titrations*

The titration curves in all cases show the sharpest inflection at about 7.5 pH. This then is the equivalence point or the endpoint of the titration. The use of phenolphthalein as indicator in the titration of paper extracts is therefore incorrect. Phenolphthalein changes color at a pH of approximately 8.5, and the difference of 1 pH may cause a considerable error, especially in the titration of slightly buffered solutions such as the first extract. The error for certain papers is shown below.

The amount of acid extracted as determined by the potentiometric titrations is given in Table XI. The values are taken from the titration curves and are corrected for the blank titrations, the endpoint in all titrations being assumed at 7.5 pH.

TABLE XI
TOTAL ACID IN SUCCESSIVE EXTRACTS

| Paper | Extraction Medium | cc. of 0.0054 N NaOH for Titration 1 | 2 | 3 | 4 | Micro Equivalents of Acid 1 | 2 | 3 | 4 | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| G | Water | 5.49 | 2.35 | 1.40 | 1.60 | 29.6 | 12.7 | 7.6 | 8.6 | 58.5 |
| G | 0.1 N KCl | 10.15 | 4.77 | 2.79 | ... | 54.8 | 25.8 | 15.1 | ... | 95.7 |
| A | Water | 7.45 | 1.69 | 0.90 | 0.65 | 40.4 | 9.1 | 4.9 | 3.5 | 57.9 |
| A | 0.1 N KCl | 11.55 | 2.69 | 1.35 | ... | 62.4 | 14.5 | 7.3 | ... | 84.7 |

The effect of choice of endpoint of the titration on the total acid found is given in Table XII.

*Prediction of Paper pH from White Water pH*

The possibility of using the pH of white water as a means for predicting the pH of the finished paper suggested the desirability of a further study of the factors involved. The relations are important not only as they may determine the acidity of the finished paper, but in that nearly the same conditions exist during the water extraction.

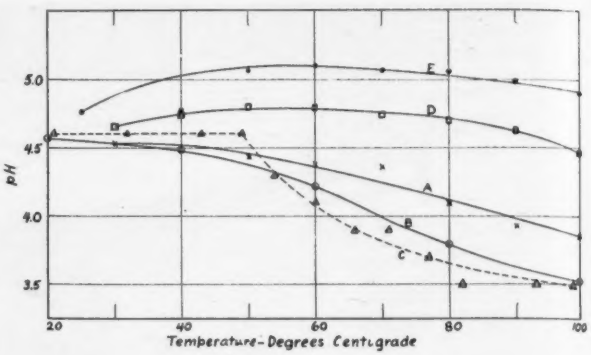


FIG. 7

The effect of temperature on pH of white water. A—White water heated to designated temperature and immediately cooled. B—White water heated at designated temperature for one hour. C—Curve reproduced from data of Chase, effect of heating on pH of white water. D—Curve reproduced from data of Minor and Blaisdell, effect of heating on pH of white water. E—Curve reproduced from data of Minor and Blaisdell, effect of heating on pH of alum plus sodium carbonate.

TABLE XII
EQUIVALENTS OF ACID TITRATED × $10^6$

| Assumed Endpoint: | 7.5 pH | | (Phenolphthalein) 8.5 pH | |
|---|---|---|---|---|
| Paper: | G | A | G | A |
| Distilled water (4 extractions)[1]... | 58.5 | 57.9 | 67.6 | 71.4 |
| 0.1 N KCl (3 extractions)[1]..... | 95.7 | 84.2 | 100.0 | 95.4 |
| pH of first water extract..... | 4.69 | 5.20 | | |

[1] Corrected for blank titration on distilled water and 0.1 N KCl respectively to the assumed endpoint.

The behavior of white water from another mill was first determined. 125-cc. portions each of white water taken from a machine making 33 per cent rag 20 pound bond paper were heated in the extraction flasks to 20, 40, 60, 80 degrees in a water bath and directly boiled for one hour. The liquid was transferred to beakers, cooled, and measured as with the pH extracts.

One liter of the same white water was heated at a moderate rate and samples taken at 10 degree intervals from 30 degrees to boiling, cooled and the pH measured.

The results obtained are given in Table XIII, and are plotted together with the data of Chase and of Minor and Blaisdell in Fig. 7. In this case the paper from the machine

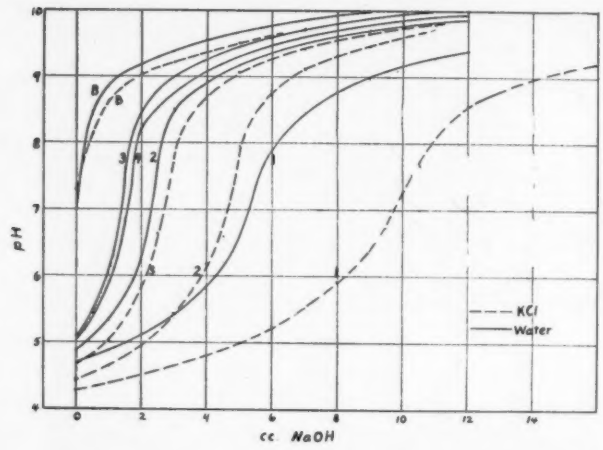


FIG. 5

Potentiometric titration of successive extracts—paper G. The numbered curves refer to the order of extraction.

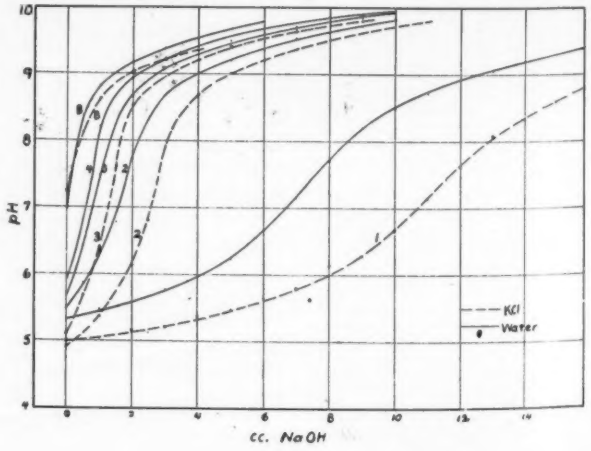


FIG. 6

Potentiometric titration of successive extracts—paper A. The numbered curves refer to the order of extraction.

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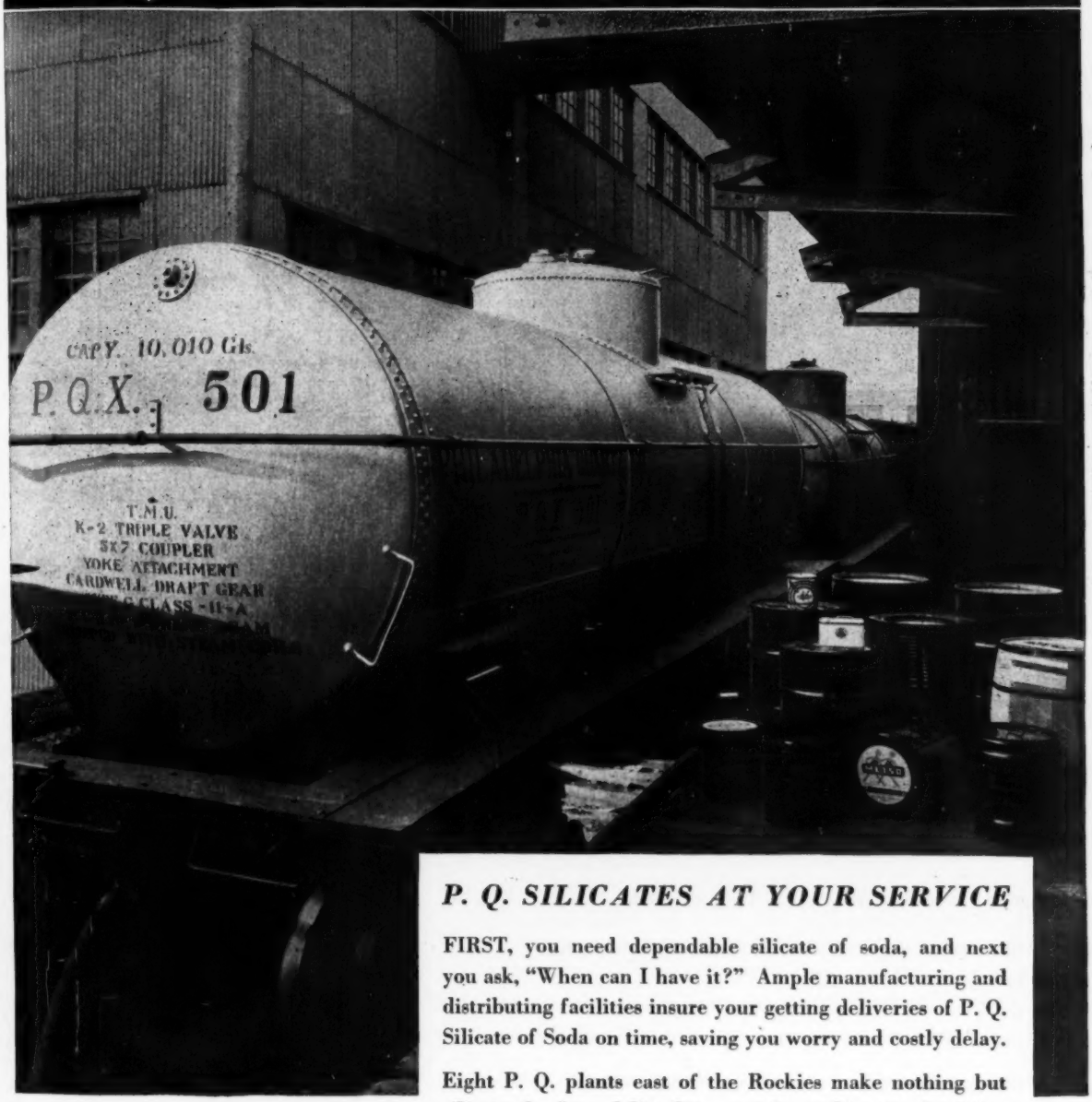


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from which the white water was taken showed a pH of 4.3, as determined by the TAPPI tentative standard method.

TABLE XIII
pH-TEMPERATURE RELATION FOR WHITE WATER

Part A: White Water Held at Temperature for 1 Hour

| | 20 deg. C. | 40 deg. C. | 60 deg. C. | 80 deg. C. | 100 deg. C. |
|---|---|---|---|---|---|
| Glass electrode... | 4.57 | 4.48 | ... | 3.79 | 3.52 |
| Quinhydrone .... | 4.54 | 4.51 | 4.22 | 3.84 | 3.57 |

Part B: White Water Heated to Temperature and Cooled Immediately

| | 30 deg. C. | 40 deg. C. | 50 deg. C. | 60 deg. C. |
|---|---|---|---|---|
| Glass electrode... | 4.53 | 4.51 | 4.43 | 4.38 |
| Quinhydrone .... | 4.53 | 4.54 | 4.47 | 4.43 |
| | 70 deg. C. | 80 deg. C. | 90 deg. C. | 100 deg. C. |
| Glass electrode... | 4.36 | ... | ... | ... |
| Quinhydrone .... | 4.28 | 4.09 | 3.93 | 3.85 |

### *Alum and Alum-Size Fiber Mixtures*

In order to determine the behavior of certain constituents of white water and paper during heating of the solution, a further series of tests was carried out.

a. The behavior of alum alone was first studied. A solution of alum ($Al_2(SO_4)_3.18\ H_2O$) was made up and adjusted to a pH of approximately 4.5 by dilution with distilled water. 125-cc. portions were treated in the same manner as in the first white water experiments.

b. 2.500-gram portions of a west coast bleached sulphite disintegrated air dry pulp were placed in the extraction flasks and 125 cc. of the alum solution added. These were heated for one hour to the temperatures indicated, cooled without filtering, and the pH measured with the glass electrode. Quinhydrone was added and the pH again determined. Then the fibers were removed by filtering once through a Jena 1G1 crucible with moderate suction and the pH again determined.

c. The bleached sulphite pulp was extracted according to the standard method modified for the indicated temperatures and by the use of disintegrated pulp and the pH measurements made with and without the presence of the fibers.

d. A solution of rosin size containing 25 per cent free rosin was prepared to contain 0.05 grams of size per 100 cc. which would amount to 2 per cent on 2.5 grams of pulp. A solution of alum was also made up and the pH adjusted so that the addition of 25 cc. of this solution to 100 cc. of the size solution would make the resulting pH of the mixture approximately 4.5. 125-cc. portions of such a mixture were heated for one hour to the indicated temperature as in the case of the alum solution.

e. To 2.500 gms. of the bleached sulphite pulp placed in the extraction flask were added 100 cc. of the size solution, the flask shaken, and 25 cc. of the appropriate alum solution added. The mixture was then heated to the indicated temperatures for one hour, cooled and measured as in the case of the fibers with the alum solution.

The results obtained are given in Table XIV and in Fig. 8.

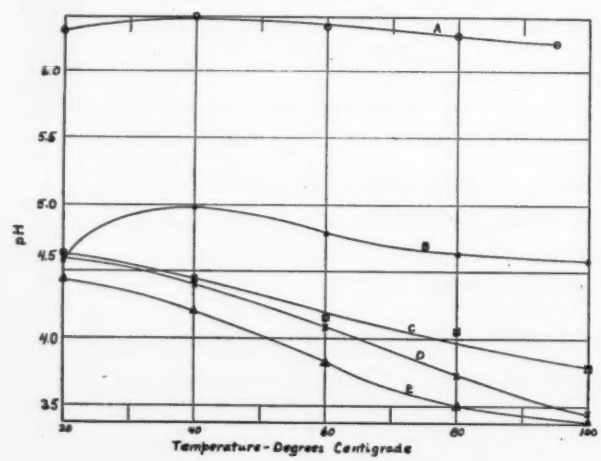



FIG. 8

The effect of temperature on pH of alum-size-pulp. A—Bleached sulphite pulp. B—Alum plus pulp. C—Alum plus size plus pulp. D—Alum. E—Alum plus size.

TABLE XIV
pH-TEMPERATURE RELATION FOR VARIOUS MIXTURES
ALUM SOLUTION

| | 20 deg. C. | 40 deg. C. | 60 deg. C. | 80 deg. C. | 100 deg. C. |
|---|---|---|---|---|---|
| Glass electrode... | 4.60 | 4 40 | 4.09 | 3.73 | 3.45 |
| Quinhydrone .... | 4.52 | 4.40 | 4.10 | 3.75 | 3.48 |
| **ALUM PLUS FIBERS** | | | | | |
| Part A: Fibers Present in pH Measurement | | | | | |
| Glass electrode... | 4.48 | 4.73 | 4.70 | 4.52 | 4.48 |
| Quinhydrone .... | 4.51 | 4.66 | 4.67 | 4.51 | 4.49 |
| Part B: Fibers Removed by Filtration | | | | | |
| Quinhydrone .... | 4.57 | 4.98 | 4.79 | 4.64 | 4.59 |
| **ALUM-SIZE MIXTURE** | | | | | |
| Glass electrode... | 4.44 | 4.21 | 3.83 | 3.50 | 3.38 |
| Quinhydrone .... | 4.39 | 4.23 | 3.88 | 3.56 | 3.37 |
| **ALUM-SIZE MIXTURE PLUS FIBERS** | | | | | |
| Part A: Fibers Present in pH Measurement | | | | | |
| Glass electrode... | 4.56 | 4.47 | 4.15 | 3.96 | 3.74 |
| Quinhydrone .... | 4.56 | 4.41 | 4.14 | 3.95 | 3.73 |
| Part B: Fibers Removed by Filtration | | | | | |
| Quinhydrone .... | 4.63 | 4.45 | 4.16 | 4.07 | 3.79 |
| **FIBERS ALONE** | | | | | |
| Part A: Fibers Present in pH Measurement | | | | | |
| Glass electrode... | 6.34 | 6.27 | 6.21 | 6.21 | 6.12 |
| Quinhydrone .... | 6.12 | 6.25 | 6.14 | 6.13 | 6.03 |
| Part B: Fibers Removed by Filtration | | | | | |
| Quinhydrone .... | 6.30 | 6.42 | 6.33 | 6.27 | 6.21 |

### *Discussion of Results*

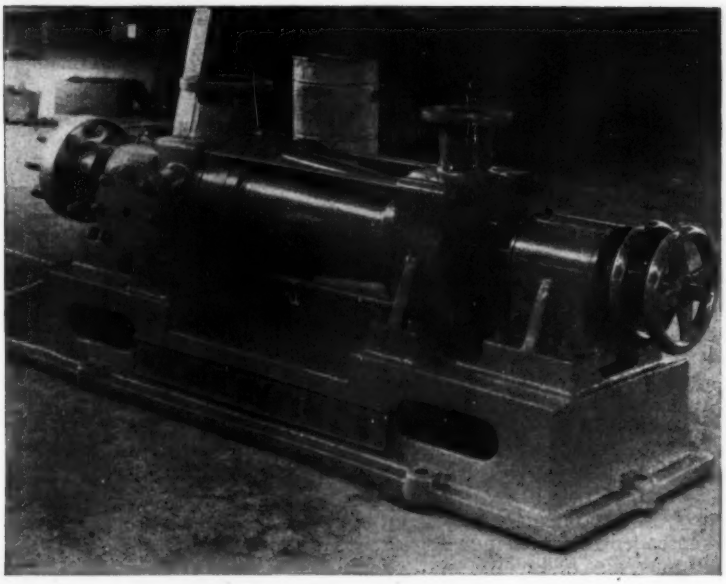
From a consideration of the available sources of acid in paper, it is generally accepted that most of the strong acid arises from the acidity of added alum, with smaller amounts of weak organic acids from the fiber, size, and coating materials.

The actual equilibria existing during the formation of the sheet and during the water extraction of the paper are doubtless quite complicated. Both hydrolytic and adsorption equilibria act in a complex system of water, alum, fibers, size, coating, and minor amounts of other materials. That equilibrium is essentially obtained in the water extraction is shown by the fact that an increase in extraction time beyond a certain minimum does not change the pH value obtained.

The importance of alum in determining the acidity of the stock and of the finished sheet justifies a more thorough study of the acidic behavior of alum in such systems than has been made heretofore. Some applications of the work of Thomas *(20)* who has discussed and investigated several phases of the behavior of aluminum salts and hydrosols may profitably be made. Thomas has extended the idea of complex ion formation postulated by Werner and developed by other investigators in studying the phenomena of olation and oxolation.

Briefly, the idea considers aluminum in solution not as a simple ion, but as a hydrated ion of varying complexity. A change in configuration of such a hydrated ion, due to external causes, may lead to a still more complex ion with more firmly bound hydroxo (—OH—) groups. This is called olation. Further change may lead to a linkage such as (—Al—O—Al—) in the complex ion or oxolation. These changes may be brought about in many ways, such as by heat, change in H-ion concentration or the addition of certain salts. While reversible, the reaction toward the simple ionic form is very slow and the complex ions containing the (—OH—) and (—O—) linkages are therefore quite stable chemically.

The presence of further but decreasing amounts of acids in successive paper extracts is well known. The pH value and the total acidity of successive extracts for two papers has already been given (Table VIII and XI). Such acids,



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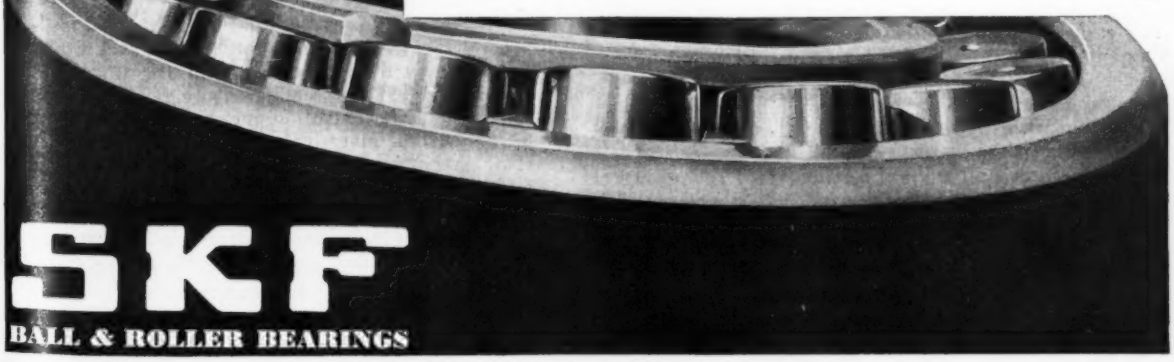

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insofar as they are derived from alum, may arise either from sulphuric acid adsorbed as such upon the fibers, or from the further hydrolysis of partially hydrolyzed alum which is itself adsorbed. Sufficient data are not available to determine definitely the proportions of acid derived from hydrolytic and from adsorptive equilibria.

In the first paper extract most, if not all of the weak acids appear. The stronger acids present will to a considerable extent displace the weaker, if adsorbed, or if present in the form of salts. Strong acids only appear in the subsequent extracts being produced either through hydrolysis and olation of the alum induced by boiling or by removal of adsorbed acid, until equilibrium is reached and the pH value resulting halts further action.

If hydrolysis takes place according to the usual dissociation equilibria, then all of the weak and strong acids and all of the alum should appear in the first paper extract and successive extracts should contain only acids removed in accordance with adsorption equilibria. The slow attainment of equilibrium in the first extraction suggests that a considerable portion of the acids appearing are due to hydrolysis. The relatively large amount of acids appearing in subsequent extracts then suggests that hydrolytic equilibria must also be involved in these extractions.

It is reasonable to expect that hydrolysis and olation of the alum in the first extraction results in the formation of basic sulphates which are colloidal in character, and which are adsorbed and bound on the cellulose fibers. Subsequent extractions lead to further hydrolysis under approximately the same equilibrium conditions; that is, the alum hydrolyzes until the acid formed halts the hydrolysis, so the second and third extracts have pH values only slightly less than the first. At the same time the amount of total acid extracted decreases as the alum is removed by successive hydrolytic reactions.

Again, since KCl does not effect any great change in either the total amount of acid extracted or in the pH of the extract, it is probable that adsorption of acid plays a small part compared to hydrolysis of residual alum. In fact, the differences noted in the presence of KCl may be accounted for by the action on the hydrolytic equilibria of the alum alone.

The effect on heating of white water has been shown in Fig. 7. That the heating of white water in this work and in that reported by Chase resulted in a sharp drop in pH may be explained on the basis of the above discussion.

Further the results shown in Fig. 8 point to the possible divergent results in heating of white water. Thus alum, alum-size, and alum-size-pulp mixtures show a comparable decrease upon heating. The curves also resemble in character the white water curves in Fig. 7 and the curves representing the effect of temperature on pH of extract (Fig. 3). Whether or not the reasons for decrease in pH upon heating are identical in all cases, it is certain that the alum present together with size and fiber in all cases can account for the observed effects.

On the other hand alum plus pulp, pulp alone, or, as Minor and Blaisdell have shown, alum plus sodium carbonate give no drop in pH upon heating and at lower temperatures exhibit a slight rise. Whether or not the white water does exhibit a decrease in pH in heating may, therefore, be explained upon the basis of alum-pulp-size composition of the white water.

Certainly the alum-pulp-size relations in the white water are not the same as those in the paper and, therefore, it is not logical to expect that the pH will be equally affected in both cases. Further, as Minor and Blaisdell point out, the addition of water for the extraction in the pH determination gives an entirely different system than that existing in the paper during its formation.

The reason for the difference of behavior of alum and alum plus pulp is not clear. In both cases less total alum is present than in the papers used and in the alum-size mixtures, so that less reserve acidity which may be affected by hydrolysis is present.

The relation between the pH of the white water and of the finished sheet is therefore indeterminate except for one rigid set of conditions. Factors involved are the temperature, the amount of precipitated alumina, and the relative amounts of alum appearing in the white water and in the finished sheet. Variations in these factors will in most cases be different for the white water and for the water extraction of the finished sheet according to the usual methods.

The relation between total acidity and the pH value depends on the relative amount of strong and weak acids present, and upon the conditions governing the hydrolysis of the alum in the paper during the extraction. It is to be expected, as actually found, that the total acidity and the pH values bear no exact relation to each other and may not be in the same order in a series of different papers.

The problem of relating acidity and pH values to the use requirements of paper is dependent upon the effect caused by the specific nature of the acid present. The effects may be divided into two classes, the effect of hydrogen ion concentration and the effect of total acidity, corresponding to the two determinations in so far as these determinations represent the equivalent conditions in the paper itself. Deleterious effects due to hydrogen ion concentration may be considered those in which the acid enters the reaction to only a very slight extent, or enters into a surface reaction, or promotes other undesirable reactions. Deleterious effects due to total acidity are those in which the reaction and removal of the acids present constitute the chief reaction.

It is probable that most of the deleterious effects of paper acidity are in fact due to effects which are more exactly measured by hydrogen ion concentration than by total acidity. Stated in another way, paper acidity may give rise to very serious undesirable effects long before any appreciable amount of the total available acid is used up in chemical reactions which may be involved. Further acid formation may indeed be the result of the deleterious action of acid already present. The use of more than one extraction of the paper therefore appears unjustified.

In any case, an increase in acidity by either method is obtained by boiling during the water extraction. If the increase in acidity is due to hydrolysis of alum, the question of whether or not this hydrolysis should be promoted by boiling hinges upon whether a similar reaction will occur in the paper in use. If so, and if the hydrolysis should proceed to about the same extent, then the promoted hydrolysis by boiling is justified. Otherwise the cold extract of the paper should be used for measurement of acidity.

In any case in which the total available acid is the most important factor, the total acidity method is indicated. The problem involved then is to obtain for titration exactly the acidity which is effective in use. The evaluation of hydrogen ion concentration measurements is more difficult. As several investigators have pointed out, the term "pH of paper" is without meaning, since ordinary dissociation laws do not hold in such a heterogeneous system, and adsorption effects play a large role.

Further work is under way in this laboratory on the behavior of alum acidity as it affects the acidity of paper.

**Summary**

The TAPPI tentative standard method for determina-

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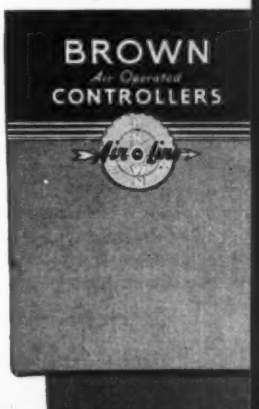


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tion of hydrogen ion concentration in water extracts of paper has been studied with reference to details of the extraction procedure. The water-paper ratio and the time of extraction specified are satisfactory for the papers investigated. The temperature of extraction should be controlled more closely than 95 to 100 deg. C., and a maximum allowable variation of ± 1 deg. C. is suggested.

Carbon dioxide which is present in ordinary distilled water did not cause appreciable error in papers having a value of 6.0 pH and below. No unusual precautions were found necessary in avoiding exposure of the extract to the atmosphere since carbon dioxide is easily excluded by stoppering of the extract during cooling. The pH of the extract should be measured within a few hours, since a slow rise in pH takes place upon long standing.

Since lower pH values are obtained with cut than with disintegrated paper samples, and since a disintegrator may not always be available, the use of cut samples is suggested. Better agreement has been obtained with cut samples.

The determination of both pH values and potentiometric titration curves in successive extracts of paper shows that nearly all the weak acids present appear in the first water extract. Subsequent extracts contain only strong acids. The pH value of successive extracts rises very slowly. It is probable that most of the acid appearing after the first extraction is derived from hydrolysis of alum bound on the fibers after olation or oxolation produced in the drying of the paper and in the first extraction. Some of the acid may be derived from sulphuric acid adsorbed by the cellulose; the proportions of the two sources cannot be determined from data at present available.

Salts such as potassium chloride added to the extraction media cause a slight increase in acid appearing in the extract. The results of successive extractions in the presence of such salts indicate that removal of adsorbed acids is not the most important factor in determining the acidity of the extracts.

The prediction of the pH of paper from the pH of the stock and of the white water depends upon the relative proportions of alum, size, and pulp present and upon the similarity of conditions in the formation of the paper and in the water extraction. The results of boiling of artificial mixtures of alum, size, and pulp indicate the impossibility of accurate prediction of pH unless all conditions of composition and treatment can be maintained throughout.

The need for further work on the nature of acids present and on their relative effects in the use requirements of paper is suggested. Significant methods for measurement of paper acidity should relate directly the amount and nature of acids present to the effect of such acids upon changes in desired characteristics of the paper during actual use.

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# The Paper Industry and the Business Cycle*

By Louis T. Stevenson[1]


### Abstract

*Deductive reasoning points to the conclusion that the production of paper as a raw material for consumers goods, part of which are "luxuries," should move in the same direction and at the same time with industrial production but not to the same extent in depressed periods.*

*This conclusion is borne out by a statistical study.*

*No theory entirely satisfactory for forecasting the business cycle has yet been developed.*

*An empirical method is suggested for determining the current phase of the business cycle. This should be used cautiously and with full knowledge of its limitations. When so used it should be helpful to management in determining current policy.*


Every business investment is based on a forecast of some sort. The forecast may be the result of a careful and considered study of fundamental data or it may be just a "hunch" that "conditions warrant the expenditure." Sometimes the "hunch" method is really a more or less conscious synthesis of a great amount of unclassified information gained from experience and observation.

Scientific management requires that all decisions be based on accurate information concerning all of the pertinent facts of a given situation. For many business decisions these include a knowledge of the business cycle; in what phase it is, and the relationship to it of the particular industry and organization under consideration. We can forecast the probable results of a given act with greater assurance of success if we first determine these points.

### The Question

What then, if any, is the relationship between the paper industry in the United States and the business cycle? Do the many and complicated forces which produce business cycles affect the paper industry and if so how and when?

* Presented at the Annual Meeting of the Technical Association of the Pulp and Paper Industry, Waldorf-Astoria Hotel, New York, N. Y., Feb. 17 to 20, 1936.

[1] Member TAPPI, Paper Manufacturers Agent, 17 East 42nd Street, New York, N. Y.

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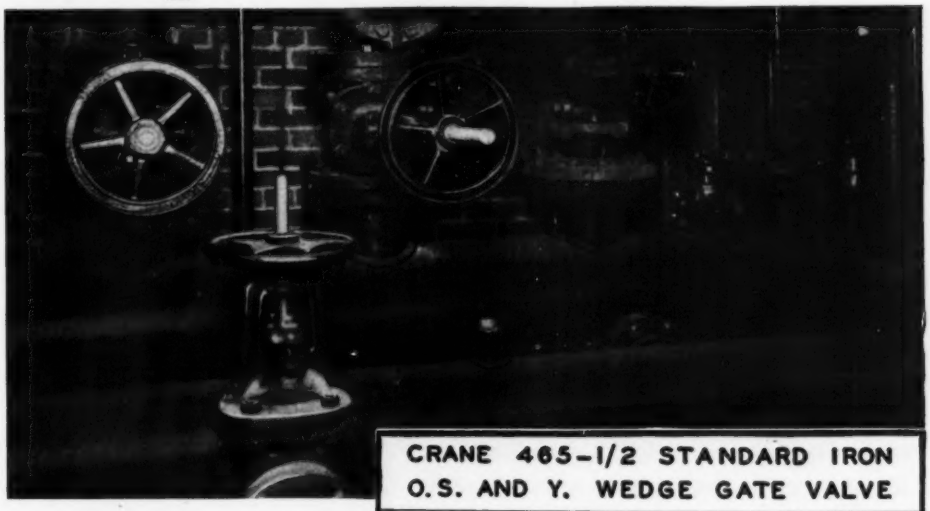
# Every Day Or Once A Year



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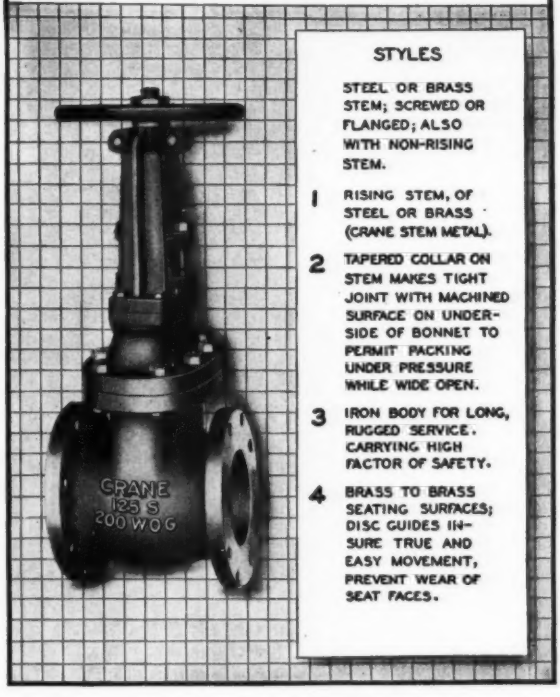


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This discussion will be confined to the consideration of these questions and to indicating briefly the possible applications of the findings.

### The Business Cycle

It is not necessary to tell any one who has been in business during the last ten years that business activity has distinct periods of ups and downs. One has but to look at a chart of any good index of business activity to observe a certain irregular wave-like motion. It seems never to be stationary but always to be on the up or down grade. Fig. 1 shows such an index.

### The Business Cycle Defined

Wesley C. Mitchell defines the business cycle as "a species of fluctuations in the economic activity of organized communities. The adjective 'business' restricts the concept to fluctuations in activities which are systematically conducted on a commercial basis. The noun 'cycles' bars out fluctuations which do not recur with a measure of regularity."*(1)*

### How Much Do We Know About Them

Although much has been said and written about them our knowledge of business cycles is far from complete. As in many economic discussions deductive reasoning has been frequently applied to very meagre factual material. *(2)*

The first serious statistical study was made by W. S. Jevons about 1878.*(3)* Since then the business cycle has received considerable attention from statisticians and economists. Among other efforts past and present may be mentioned that of The National Bureau of Economic Research under the direction of Dr. Mitchell which is conducting a study of 800 time series that covers four major countries in an effort to learn more about business cycles. The results of this study should increase our knowledge and perhaps lay the factual foundation for a new theory of the business cycle.

### Some Characteristics of Business Cycles

Business cycles are usually divided into four separate periods. One writer uses the terms prosperity, recession, depression and revival, *(4)* while another calls the periods boom, recession, depression, and expansion. *(5)* "Clearly the idea of rhythm in the flow of business is involved."*(6)* The four periods have been called "phases" of the cycle. *(7)*

One of the most generally recognized facts about business cycles is that they vary considerably in length. In the United States from 1796 to 1923 available data indicates a length varying from one to nine years, with three years occupying the modal position and four years the arithmetical average. *(8)*

### The Normal Concept

The term "normal" has been much abused at times. We speak of "normal" business and "normal" profits many times when we really mean *good* business and profits. As applied to the discussion of the business cycle the expression is not satisfactory. For our purposes the term "secular trend" will be used as describing the base around which the various time series fluctuate. *(9)*

### The Problem of Determining Current Phase

The answer to the question "Where are we in the business cycle?" depends largely on the location of the secular or long time trend in relation to the current data, and on the immediately preceding data. For example, if the current datum point lies *below* the trend line and *above* the immediately preceding data we may well be in the revival or expansion phase. If on the other hand the current datum point lies *above* the trend line and *below* the immediately preceding data we may well be in the period of recession.

Thus the determination of our current position in the cycles revolves around the location of the true secular, or long time trend, as it is sometimes called.

The computation of a secular trend line for a given time series by the method of least squares is not difficult mathematics. Where then is there so much difficulty in knowing when we have reached top or bottom in the business cycle? It lies in the fact that the correct trend line for today's data will be affected by future data. One who calculated for instance a trend line for the Federal Reserve Board's Index of Industrial Production from 1919 to 1929 would get a sharply rising trend line whereas the same index for the period from 1921 to 1933 shows a declining trend line. (See Fig. 1.) The correct trend line for present and past data depends on future data as yet unknown. This future data is influenced somewhat by present occurrences. One of the forecaster's problems is to determine the effect on future data of the available present data and from that the true present trend. There must be a causal relationship between the two, else the present data will not affect the behavior of the data yet to come.

### Representative Series

There is no single time series that gives an absolutely accurate picture of the business cycle. Pig iron production has the advantage of being a single series for which we have data covering a rather extended period. Its swings are, however, wider than industry as a whole. Strikes affect it greatly and moreover the increased use of scrap has tended to keep pig iron production relatively low in recent years. *(10)*

Among the more complicated indexes may be mentioned the following.

1. New York Times Index of Business Activity.
2. Federal Reserve Board Index of Industrial Production.
3. American Telephone and Telegraph Company's Composite Index of General Business Activity.

These vary considerably in their components but their general behavior is remarkably uniform. The first two will be found plotted for recent years in Fig. 1. These are both well known and carefully compiled. The Federal Reserve Board Index contains a paper production series which the Times Index does not. It will be observed that the behavior of the two indices is practically uniform allowing for the fact that they are computed on different bases. *(11)*

### Characteristics of Index Numbers

It should be borne in mind that an index number stands for or represents a number of different components. These components each vary from time to time, sometimes in opposite directions, so that they may affect each other. In this respect they partake of the nature of averages. The individual movements of the separate series are not disclosed by the index number series but on the other hand are concealed by it. For the purposes of this study the Index of Industrial Production of the Federal Reserve Board will be used as a representative of the business cycle. Its fixed base is the same as that of many paper series, making it comparable, while it is believed that its paper component does not affect its comparability or responsiveness as an index of the business cycle.

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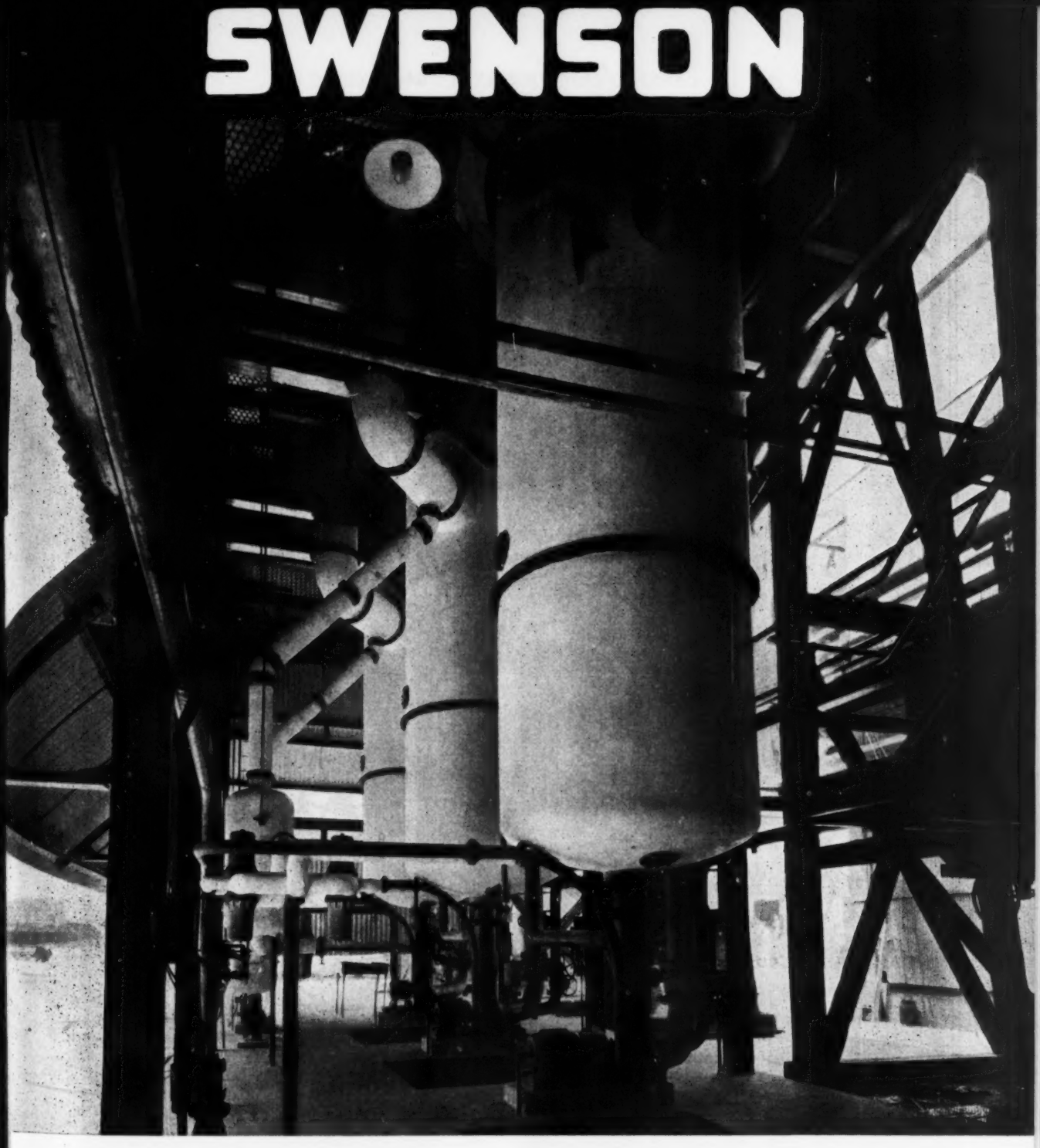

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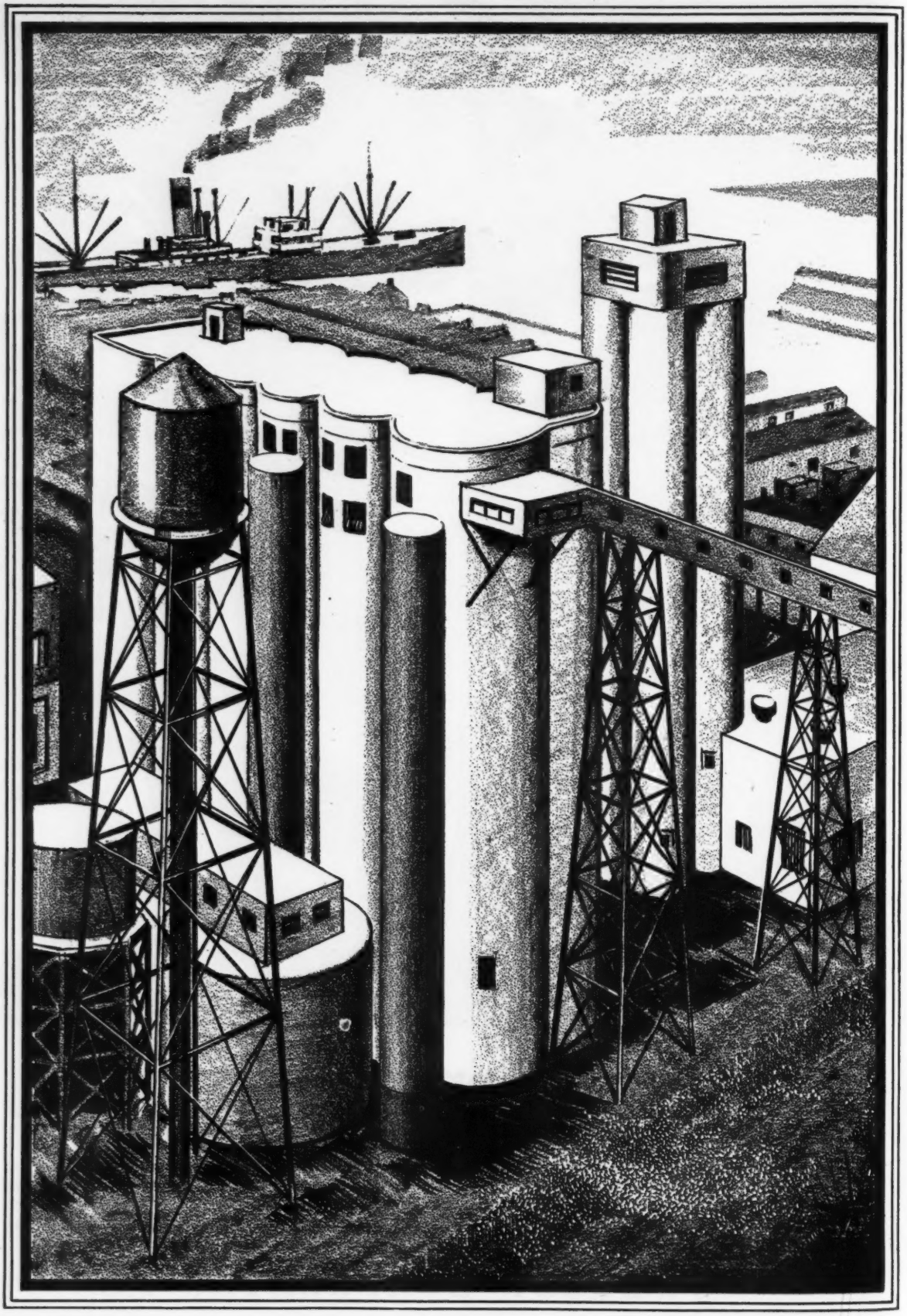

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### Relationship Between Paper Industry and Industrial Production

An index of total paper production has been constructed based on the 1923 to 1925 average annual production to correspond to that of the Index of Industrial's Production. This index was then adjusted for seasonal variation, a secular trend line fitted by the method of least squares for the period from 1921 to 1933 inclusive. A similar trend line was then calculated for the Federal Reserve Board's Index of Industrial Production adjusted for seasonal variation. The two series with trend lines are plotted in Fig. 1.

### Deviations From Trend

By taking the trend line as zero for each series and plotting the deviations of the two curves from the trend lines we obtain a deviation from trend or "cycle chart" as shown in the bottom chart, Fig. 1.

With the secular trend lines as the base the cycles of each series are not difficult to distinguish. The Industrial Production curve is smoother than that of Paper Production because of the tendency of the many components of industrial production to compensate and "smooth" the curve. Nevertheless the cycles are readily discernible.

### Limitations of the Data

The Federal Reserve Board Index of Industrial Production is too well-known to require comment other than that for our purposes the Index has been used after adjustment for seasonal variation. The Index of Total Paper Production is calculated from data as contained in the Survey of Current Business as recently revised by the editors. The final data used has also been checked by the American Paper and Pulp Association. The 1935 data were the preliminary estimates of the association.

### Analysis of Charts

There seems to be a very interesting similarity of behavior between the two series. The movements are sharper in the paper production series. The paper series changes direction before industrial production in January and September, 1923, January and June, 1924, and July, 1932. Industrial Production changes direction before the Paper series in March and July, 1933. The peak for Industrial Production series was in June, 1929 and the bottom in July, 1932 and March, 1933. In 1929 paper production shows a triple peak, namely, in January, May and August, and there was a bottom in July, 1932.

### Conclusions From the Data

There is nothing in the study so far that will determine a definite lag or lead of one series over the other. However, a rather close conformity of the one series to the other is discernible. The peaks and the troughs correspond fairly closely in timing. Paper production seems to have about the same amplitude to its swings about the trend line as industrial production during "normal" periods. But during periods of great change such as 1921 to 1923 and from 1930 to 1933 inclusive, paper seems to deviate from its trend less than the deviations of industrial production.

While the demand for paper is, speaking broadly, a

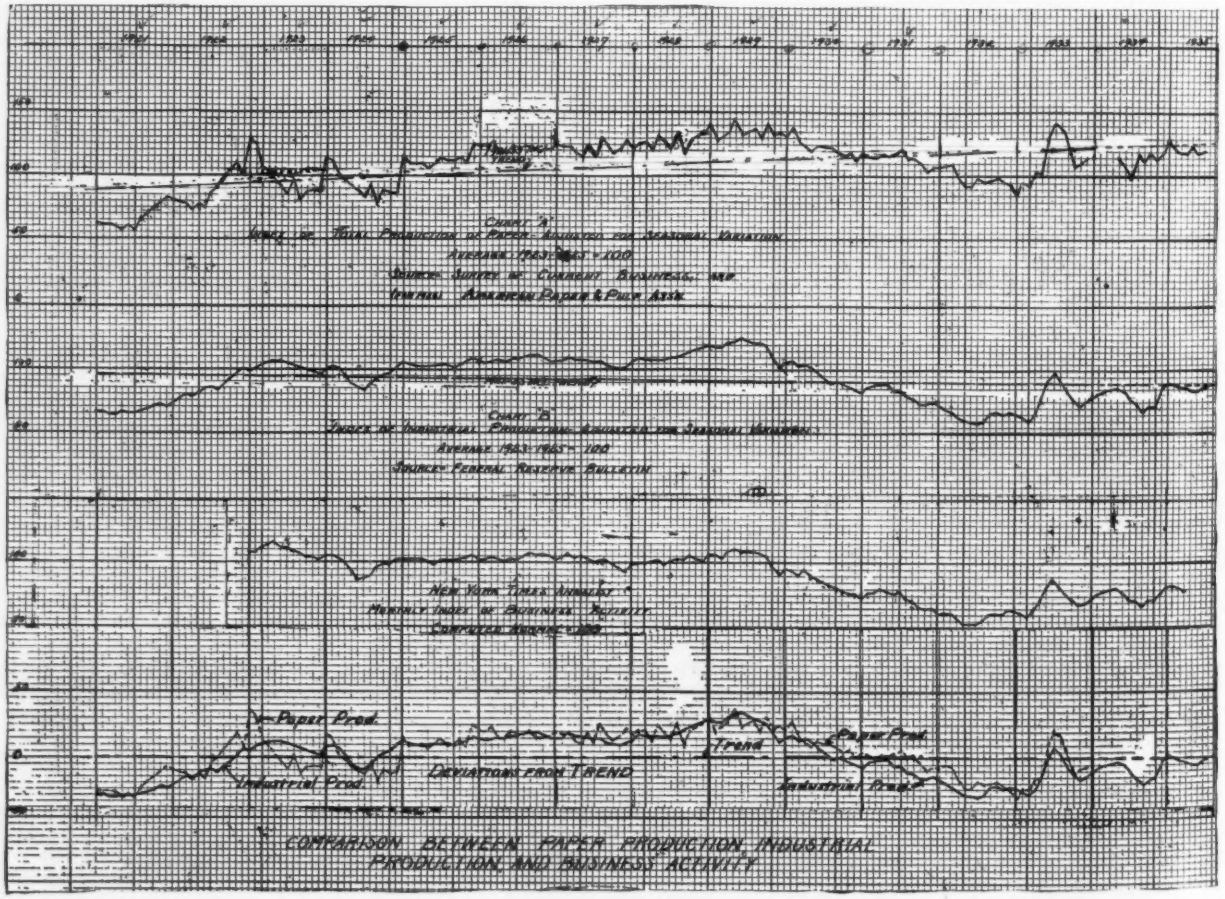


FIG. 1

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SATIN WHITE
CALCIUM ALUMINATE
CASEIN
CASEIN SOLVENTS
SULPHONATED OILS
SULPHONATED TALLOWS
ALUMINUM SULPHATE (Alum)
IRON FREE ALUM
SILICATE OF SODA
PAPER FILLERS
FOAM KILLERS
ANTI-FROTH OIL
PINE OIL
COTTON PULP
NITROCELLULOSE
SALT CAKE
SOAP POWDERS
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ATLANTA, GA. MARRERO, LA. FREEMAN, ONT. ERITH, ENGLAND

PM 34

derived demand, paper is usually demanded as a raw material for consumer's goods. *(12)* In many cases paper is a "luxury" to the extent that it can be dispensed with if necessary. This can be done to a certain extent, although in many cases it is indispensable to the functioning of our social order. As is well known, during depressed periods producer's goods suffer a great deal more than do consumer's goods. As paper is dependent for its demand upon consumer goods demands, it does not deviate from trend so much as industrial production as a whole during depression periods.

### The Application of the Theory

That paper production as a whole corresponds in timing fairly closely in its fluctuations with Industrial Production seems clear. Because of ability to shift from one grade to another on the part of many paper mills there is a tendency in the industry for supply to be rather fluid. It readily shifts to meet different demands. It is possible within certain limits of course, to consider the industry as a whole and still maintain touch with realities.

Taking the industry as a whole, it is possible to say that whatever influences tend to increase Industrial Production also tend to increase Paper Production and vice versa.

These influences do not always cause movements of Paper Production to the extent that they affect Industrial Production. The two do, however, generally move in the same direction.

If we can anticipate relative changes in industrial production as a whole or in general business conditions we can anticipate relative changes in Paper Production. When the problems of anticipating moves in the business cycle are solved, the same problem for the paper industry under current conditions will also be solved.

### Theories of the Business Cycle

Under present conditions the business cycle is the resultant of many forces. Mitchell describes ten theories each one of which has its advocates. Briefly listed they are as follows: *(13)*

1. The weather
2. Uncertainty
3. The emotional factor in business decisions
4. Innovations, promotion, progress
5. The process of saving and investing
6. Construction work
7. General over-production
8. Banking operations
9. Production and the flow of money incomes
10. The role of profit making

The mere list indicates the complexity of the problem. Each explanation is plausible and is backed by an appreciable body of thought. But is any one of them the whole truth about the matter? Or are they all true when taken together? It is possible to say at the present time that neither has been proved. There is no generally satisfactory theory of the business cycle. *(13a)* It may be that the enormous amount of data that is becoming available will facilitate the development of a satisfactory theory. Dr. Mitchell's before mentioned study may result in such a theory. But until a satisfactory theory is available, necessity forces us to empirical processes as an aid to forecasting the behavior of the Business Cycle.

### Some Suggestions

By plotting the curve of industrial production adjusted for seasonal variation and then computing a secular trend line for say at least ten years prior to the last available data, an approximation as to the current phase of the cycle may be determined. It is necessary, however, to be extremely cautious in using this. It should be borne in mind at all times that the trend line is merely tentative and that behavior of data as yet unknown will almost surely modify the trend as it is currently plotted from available data. Our key to the future lies in our economic analysis of current factors.

To assist us in that, it may be well to remember the following characteristics of the business cycle. Starting upward from the bottom of depression we notice:

1. Rising stock exchange prices
2. Rising commodity prices
3. Expanding volume of industrial production
4. Increasing sales and forward buying of commodities
5. Increased employment
6. Increased inventories
7. A larger demand for credit [1]

These do not always occur in the order stated.

These trends continue until a "peak" is reached, with production and stocks of goods large, prices substantially stationary, and formerly, money rates high. Before long the trends reverse and the downward spiral commences. These trends manifest themselves:

1. Falling stock exchange prices
2. Falling commodity prices
3. Declining sales and forward buying checked
4. Stocks of excess goods liquidated
5. Industrial production declining
6. Employment declining
7. Money rates stringent then falling

These trends do not always start in this order but they continue until business has become liquidated and depressed, production at low levels, low prices, unemployment increased and money very easy. These have been called by one writer "a fairly typical picture of the more essential phases" *(14)* of the business cycle.

### Barometers

Single statistical series are sometimes used as "barometers" or indicators of events to come. These series are supposed to have a lead over the business cycle. They are by no means infallible and should be used with caution. Some of such series are: *(15)*

Construction, especially residential construction.
Automobile production, especially passenger cars.
Prices of securities, especially bonds, and preferred stocks.

### Common Sense and Keen Analysis Always Necessary

It should be borne in mind that none of the methods mentioned herein should be used except as a basis for an individual analysis of a given situation. No one of them is exact or infallible. Common sense, business experience and keen analysis of all available and pertinent data should be used in each case. If the study is carried out on that basis a reasonably accurate determination of the current phase of the business cycle is possible. Thus will be provided to management more accurate data on which to base sales, production, financial, and other policies.

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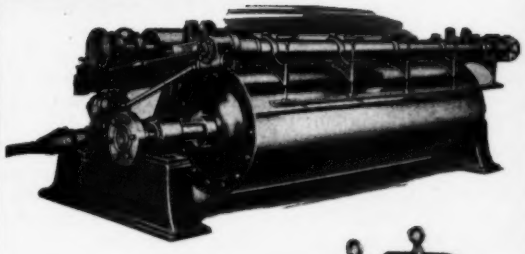
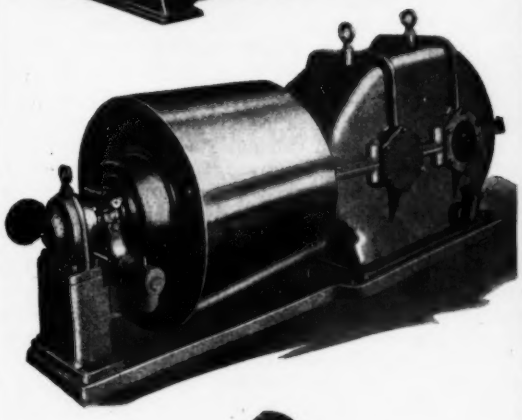
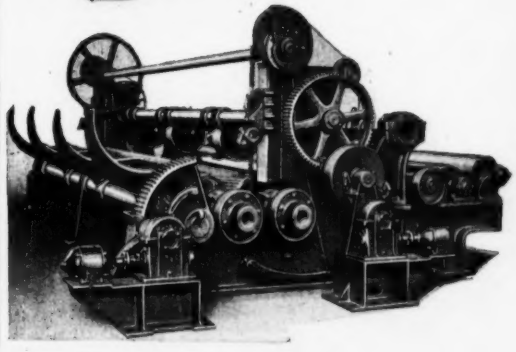
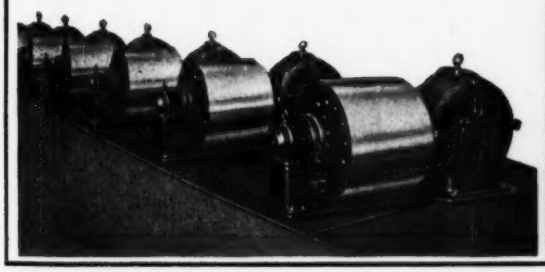
(14) Haney, L. H., page 136, "Business Forecasting."
(15) Clark, J. M., cf. *op cit*, pages 36 to 61 and 71 to 73.

[1] Until the Federal Government took control of the money market, money rates were considered an important factor. It is possible, however, that we will have business cycles with very little change in money rates if the present unprecedented plethora of excess Reserve balances continues.









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# The Cowles System for Detrashing and Defibering Waste Paper Stock*

By Edwin Cowles[1]

**Abstract**

*Contrary to the usual method, the Cowles system removes the defibered material from breaker beater stock. The undefibered material breaks down and is removed as the defibering action progresses. This is accomplished by spinning on screens, in a device known as the Cowles Classifiner, formerly known as the Cowles Refiner.*

*About 10 per cent of the stock is used as a vehicle to carry off the trash continuously. The mixture is called rejected stock. This is diluted by return water from the thickeners. Strings, etc., are fished out by forks in a Cowles Detrasher and the rejected stock is settled and then used to dilute the incoming stock, thus returning the fibers to the system.*

*Less than 0.5 h.p. is required per ton of stock handled when screening through holes between 1/8 and 3/16 inches in diameter. The centrifugal effect aids the action so that a very clear stock is obtained.*

*The Cowles system operates best at about 2 per cent consistency so much less thickening and pumping capacity is necessary.*

*As only rejected stock is settled, a settling system of less than half the size of the usual modern settling system is necessary.*

*Efficient settling is obtained because of the low consistency of this rejected stock. When operating normally there is very little cutting or other refining action on the stock. Screens and other wearing parts last from six weeks to six months.*

*It is suggested that substantial gains might be made in the way of stock clarification by settling white water and using it to wash dirt out on the thickeners if proper provisions were made.*

*Stock prepared in the Cowles system for detrashing and defibering waste paper stock shows a comparatively small drop in freeness.*

*The Cowles Classifiner shows evidence of being adaptable to the refining of paper stock, though we do not yet know much about this application.*

*The Cowles Classifiner can also be used to classify fibers and we are speculating as to what, if any, practical use there may be for such an application.*

The system which I will discuss in this paper applies expressly to the clarification and defibering of waste paper stock as prepared in board mills in this country. This system and all special equipment which pertains to it are thoroughly protected by United States and foreign patents which are owned or controlled by the Cowles Company. The Dilts Machine Works, Inc., of Fulton, New York, functions as our exclusive manufacturing and sales agent in this country, and the entire project is being carried on under a cooperative arrangement with the Dilts Machine Works, Inc.

Instead of defibering, settling, screening, etc., which is the usual procedure, we removed defibered stock from the trash and undefibered stock which is in the mixture which comes from the beater. This results in a concentration of the trash in a relatively small amount of the stock so that the trash can more advantageously be separated and completely removed from the system and so that the undefibered stock, which is now in this remaining mixture, may be more efficiently defibered.

This operation is accomplished by spinning the crude stock from the breaker beater on a screen. It is spun fast, fast enough to give a linear velocity on the surface of the screen of from 2,000 to 5,000 feet per minute. At the same time the screens are forced by imposing a pressure on them which is supplied by the centrifugal action. Positive means for keeping the screens clear are applied so that they will not clog when forced at this unusually high rate. Fibers, of course, pass through the screens at once. Trash and undefibered stock concentrate on the surfaces of the screens. Naturally this spinning of concentrated mixtures of trash and of undefibered bits of soft wet paper on the surfaces of screens which are being forced at such a high rate, results in a rapid breaking up of the undefibered stock and a freezing of the resulting fibers from the trash. This is because the mixture is held against

* Presented at the Annual Meeting of the Technical Association of the Pulp and Paper Industry, Waldorf-Astoria Hotel, New York, N. Y., Feb. 17 to 20, 1936.

[1] Member TAPPI, President, The Cowles Company, Princeton, N. J.

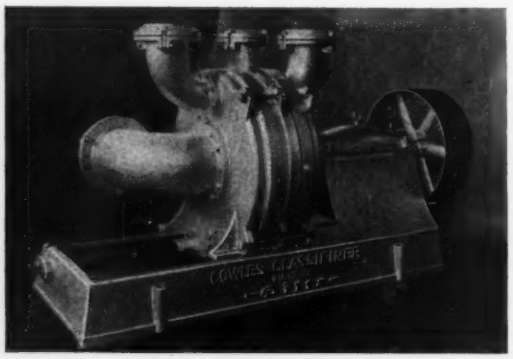



FIG. 1
Cowles Classifiner (Exterior).

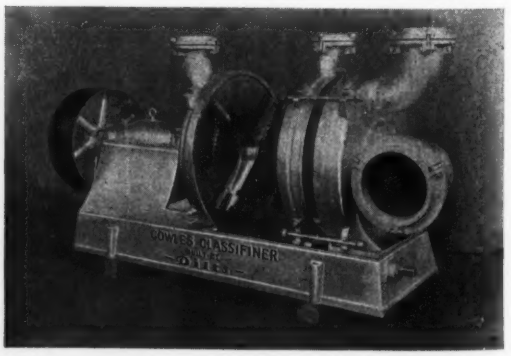



FIG. 2
Cowles Classifiner (Showing working parts).

# GULFCREST

## THE MOST STABLE TURBINE OIL OBTAINABLE . . .

## HERE ARE 4 IMPORTANT REASONS WHY GULFCREST OIL IS THE TURBINE LUBRICANT OF UNPARALLELED QUALITY

**1** GULFCREST OIL *is refined by the* ALCHLOR *process.* This famous process, patented and owned exclusively by Gulf, is the most thorough and effective method for removing chemically active hydrocarbons as well as the general run of impurities present in all crudes.

**2** GULFCREST OIL *has highest resistance to acidity and sludge.* Because of the elimination of oxidation catalysts in addition to the unparalleled refining power of the ALCHLOR process, these oils form less gum and deposits, less emulsion and sludge, when mixed with water over a period of several years' continuous operation, than any other turbine oil of which we have record.

**3** GULFCREST OIL *has highest resistance to oxidation.* Because this famous ALCHLOR process synthesizes and rearranges the molecular structure of certain hydrocarbons, resulting in a finished product of greater stability, GULFCREST OIL stands alone in its high resistance to oxidation.

**4** GULFCREST OIL *gives highest kilowatt-hour performance.* Because ALCHLOR not only makes possible an oil more thoroughly refined and homogeneous but also creates antioxidants, these oils have great resistance to deteriorating influences and are longer lived. Less make-up oil is required.

GULF INDUSTRIAL LUBRICATION

## GULF REFINING COMPANY, Pittsburgh, Pa.

Boston New York Philadelphia Atlanta New Orleans
Houston Pittsburgh Louisville Toledo

MAKERS OF THAT GOOD GULF GAS AND GULFPRIDE MOTOR OILS

the screens by the vigorous flow through them, and because of the above-mentioned high velocity at which these materials are spun on the surfaces of the screens. The fibers which are liberated by this action, of course, pass through the screens as fast as the undefibered stock is broken up. The concentrations of trash are removed by means which will be described later. This is all accomplished in a surprisingly small compact, rugged, inexpensive machine which is now called the Cowles Classifiner. It will defiber and clarify by its combined centrifugal, screening and defibering action up to 200 tons of stock (dry basis) per day. The name has been changed from refiner to Classifiner to more particularly designate its use. We also prefer to apply the term "refine" to any action which has to do with the treatment of fibers, as distinguished from a defibering, clarifying or classifying action.

### The Cowles Classifiner

The essential elements in this device (See Figs. 1 and 2) are two circular perforated discs or screens which are clamped in a case much like the elements in a filter press. Crude stock enters through the center of the outside screen and is spun between the screens by means of a four-bladed paddle. Mounted on the paddle blades are hinged scrapers. The edges of these scrapers advance and bear directly on the surfaces of the screens. These scrapers set up an effective clearing action and provide amazingly high capacity. The screens are three feet in diameter, rugged, well supported and well secured.

We recommend that the openings in the screens be round holes between 1/8 and 3/16 of an inch in diameter. The machine runs at from 250 to 400 r.p.m. and requires 25 to 100 h.p. for corresponding capacities, ranging between 50 and 200 tons per day. There is a 12-inch diameter inlet for crude stock and 2 eight-inch diameter outlets (one for each screen) for accepted stock.

At the top of the machine and between the screens is a 6-inch outlet. Stock is also drawn off continuously at this point and this stock is called rejected stock, as materials which will not break up and pass through the screen, or which are heavier than water pass off here. An undue accumulation of trash in the case is prevented in this manner.

The design of the entire machine is rugged and all wearing parts may be quickly and economically replaced.

### Centrifugal Clarification

At this junction I would like to point out that the screens are discs which form the sides of the case. No screening is done around the periphery. Heavy particles are, therefore, impelled by centrifugal action past the screen surfaces and to the outer periphery of the case where they quickly pass off with the rejected stock. In this manner we obtain a combined centrifugal and screening action both of which supplement each other most effectively, especially as it is necessary for heavy particles to make a 90-degree turn from their direction of motion, if they are to pass through any of the screen openings and at the high velocities which we employ this is almost impossible.

### The System

The Cowles Classifiner is, of course, the key element in the Cowles system. (Fig. 3.) Stock is led to it from the breaker beater. The accepted stock from the Classifiner (1 to 3 per cent) is thickened. The return water from the thickeners is mixed with the rejected stock, and as the rejected stock need not be more than 10 per cent of the total, the resulting mixture of return water and rejected stock is very thin, less than 0.5 per cent. This mixture is passed over forks in a simple device which is called the Cowles Detrasher. (Fig. 4). Stringy materials are fished out by the forks in the Detrasher. The remaining mixture of thin rejected stock is then settled, after which it is used to dilute the incoming stock to the Classifiner down to the required consistency of 1 to 3 per cent.

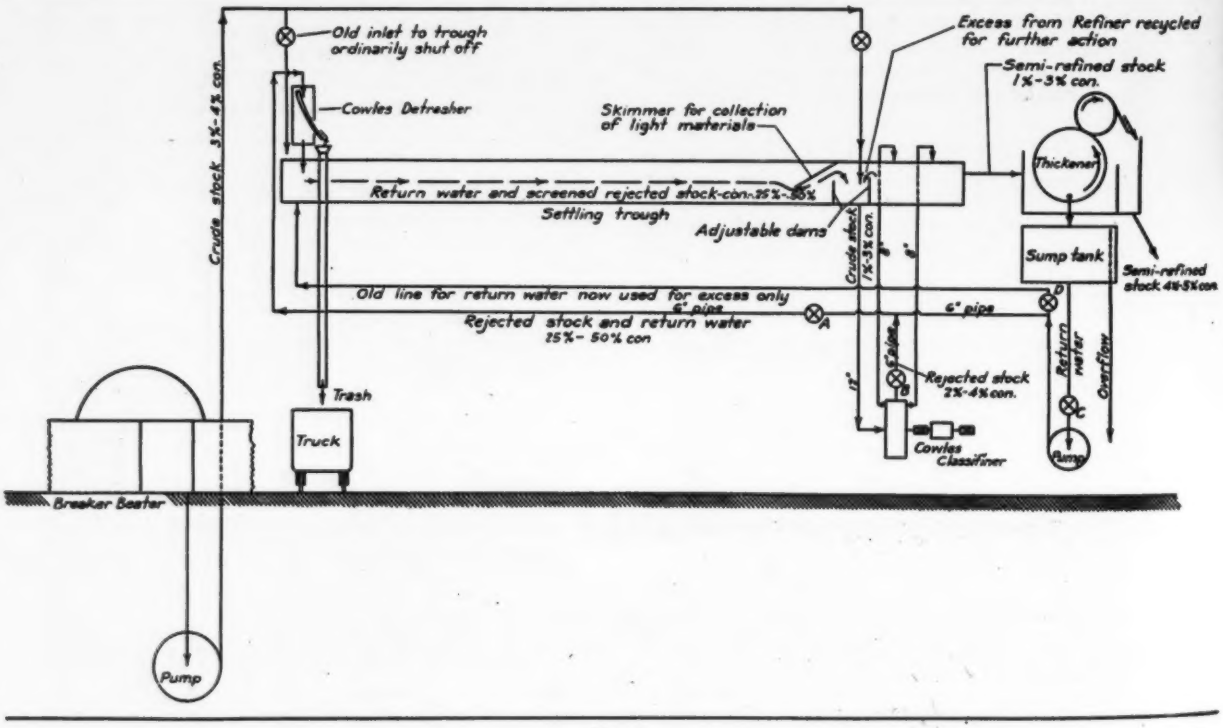
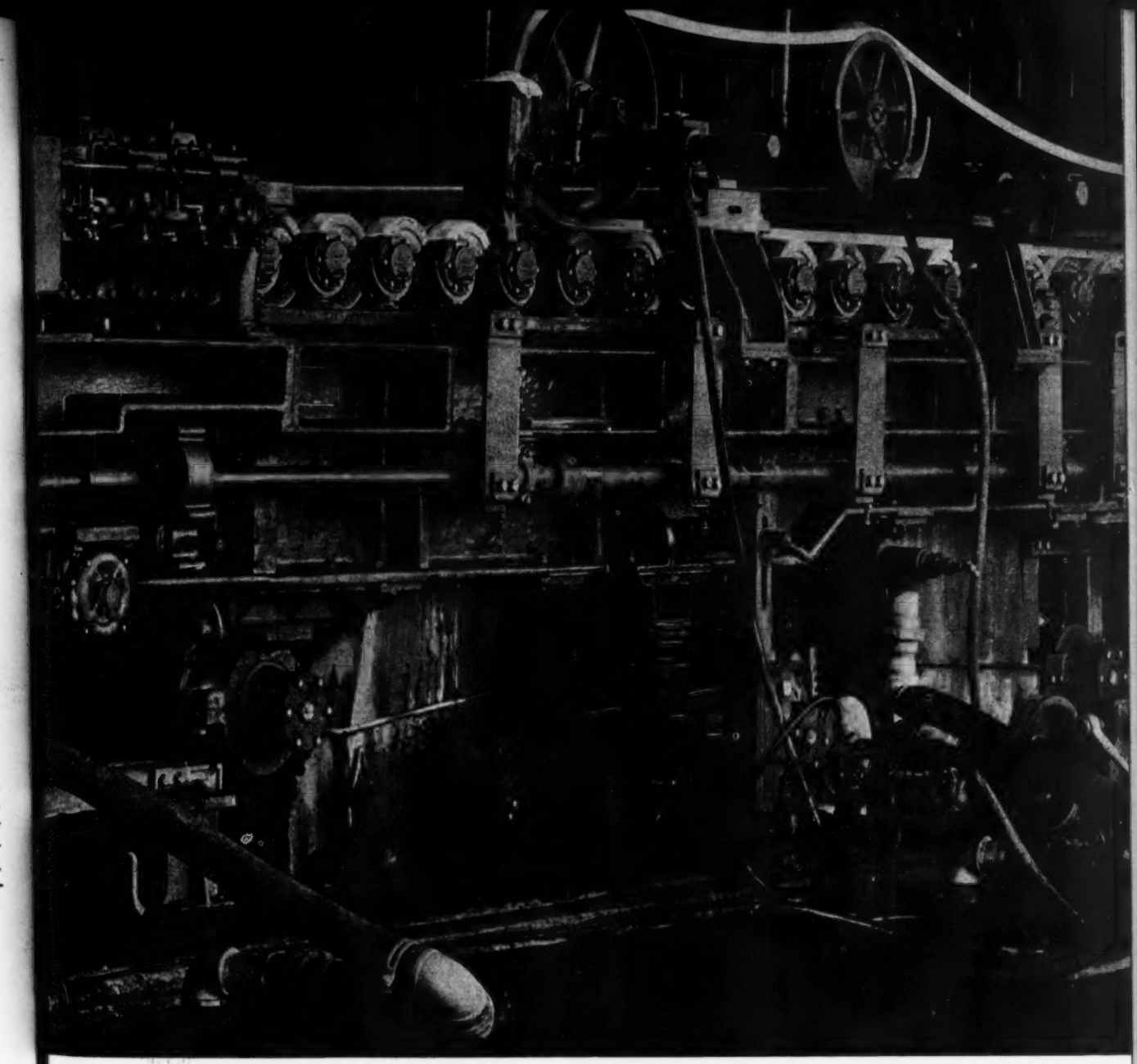



FIG. 3

Flow sheet showing preferred method of adapting an old settling system to use with a Cowles Classifiner.



NOUNCING the improved "Puseyjones" Fourdrinier Wet End with all parts of non-corroding, acid resisting construction. Castings *formerly* made of bronze, iron or el and painted, are *now* of "Hybnickle", a special stainless steel alloy, exclusive with The Pusey and Jones Corporation, produced in the latest type electric furnace.

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***Established 1848. Builders of Paper-making Machinery***

**[NEWS-PRINT : BOOK PAPER : KRAFT : BOARD]**

***Wilmington, Delaware, U.S.A.***

THE SIGN OF TRADE MARK SUPERIOR QUALITY

In this way the desirable elements in the rejected stock are salvaged.

The centrifugal clarifying action of the Classifiner is so much more efficient than the usual settling trough, even when operating our system at consistencies as high as 2 per cent that no other settling action on the stock is necessary and only the rejected stock need be settled. This represents only about 10 per cent of the total so a comparatively small settling system is required.

The thickening capacity also need be much less than is usually the case because of the higher consistency which is used in the Cowles System. All of this permits a simple, compact, inexpensive and yet a most efficient layout.

### Action of Fibers

There has been much talk about the action which the Cowles Classifiner has on fibers. That is to say, regarding the hydration, cutting, and fibrilation of the fibers. The effect in these respects can be varied to a very considerable extent by the method in which the Cowles Refiner is operated. These variations may be accomplished in the following respects:

a. Providing considerable excess capacity in the refiner, so that a large surplus of accepted stock may be recycled back through the machine for further treatment, and further providing means for regulating the amount of this recycling.

b. By changing the consistency of stock.

c. By changing the design of screens.

There generally appears to be some hydration or other refining action on the fibers which is probably due to a hammering by the scrapers of fibers which staple in the holes on the screens. This hammering or mechanical action may be increased very materially by increasing the consistency which increases the tendency to staple in the holes. This mechanical action and resulting hydrating effect can also be increased by increasing the amount of recycling, or in other words, the number of times which the stock passes through the screen. This is accomplished by making adjustments so that stock recirculates or "recycles" back through the Classifiner. If stock is not allowed to recycle and the consistency is kept around 1.5 per cent especially when coarser screens (3/16 inch diameter holes) are used, there is almost no hydration or other action on the fibers.

We have examined stock from the Cowles Classifiner repeatedly for evidence of a cutting action on the fibers and under ordinary conditions hardly any effect of this sort can be detected. This is probably because it is difficult to keep the edges of the scrapers very sharp in the presence of the large amount of trash which must be handled and because there is not much stapling of fibers in the holes under these conditions.

For the purposes under discussion the Classifiner must necessarily be operated primarily as a screen and to clarify and defiber. Better screening and clarifying results are obtained at lower consistencies. As the Classifiner works very well in this respect at consistencies up to 2 per cent and as the capacity increases with the consistency up to about 3 per cent we generally recommend a consistency of 1.5 to 2 per cent. The Classifiner has ample defibering capacity under all conditions.

### Speed and Performance

Not only the capacity but the general performance of the Classifiner is of course a function of its speed. Except in the smaller installations, however, we do not believe in the practice of trying to refine, that is to hydrate, fibrilate

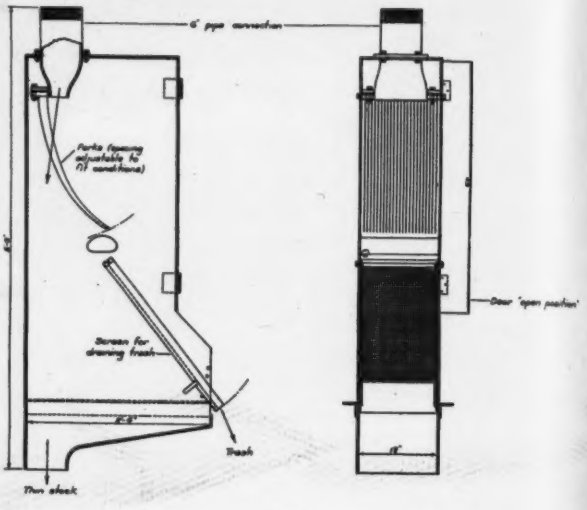

FIG. 4
The Cowles Detrasher.

or otherwise treat the fibers to any great extent, in the presence of trash. We, therefore, generally recommend running the Classifiner just fast enough to give a capacity and a clarification and defibering action which will meet all conditions which may be imposed upon it. We take any refining action which may accompany this manner of operation and are thankful for it, but we do not make any particular claim in this respect, except that any such action will prove to be beneficial and that it will result in savings in Jordan power or in the power which may be used for a final refining action on the stock.

### Wear and Replacement

One might expect both screens and scrapers to wear rapidly, but their life is surprisingly long, generally from six weeks to six months. Undoubtedly this long life is explained by a tendency of the fibers to staple over wearing edges and surfaces, at least sufficiently to set up a protective coating. Other wearing parts are also easily and economically replaceable, and their life is at least that of the screens and scrapers.

The various elements in the system are simple, and keeping them in continuous operation presents no problem. The Classifiner itself may appear to be a likely source of trouble, but its construction is heavy and very much like that of the centrifugal pump, although it is more ruggedly constructed and operated at a much lower speed than the ordinary centrifugal pump. Shut-downs from mechanical causes are rare indeed. The design has also been most carefully worked out to enable the handling of all classes of trash, including heavy metal parts, such as nails, small nuts, bolts, etc., also strings, hair, excelsior, Cellophane, rags, and similar materials, and no trouble is encountered from any such causes. The fact of the matter is that, if given a weekly inspection and light overhaul, these machines will run month in and month out, twenty-four hours a day, without attention and without giving trouble.

### Interesting Sidelights

So much for a general description of the system. In the course of our work we have encountered a number of incidents which have stimulated thoughts which may prove of interest to TAPPI members. These thoughts are, however, in fields which are still so new to us that we do not yet feel that we can speak with any authority.

# Shear Cut—Clean Cut

# LANGSTON SLITTERS AND ROLL WINDERS

SAMUEL M. LANGSTON COMPANY, CAMDEN, NEW JERSEY

## Stock Clarification and Washing

In our early experimental apparatus we happened to have a white water storage tank which was so formed that it made an excellent settling tank. We discovered that this tank rapidly filled up with fine dirt. Later in commercial settling systems of the usual type we observed that, even when the stock was settled at less than 1 per cent consistency and when it was well defibered and when there was ample settling capacity a great deal of dirt, fine glass and metal parts carried through with the stock. We found that we could produce a much cleaner stock with our system because of the centrifugal clarification action in our Classifiner but even with this method we could not get all of the fine dirt out of the accepted stock.

Now, if it is important to get this dirt out and we believe that it must be in making many grades of board, we suggest, that the white water from the thickeners be settled before returning it to the system. We have never seen this done commercially but it would seem to us that such a procedure would provide an excellent method of washing fine dirt out of the fibers and we believe that this is the best practical way to remove fine suspended materials because of the tendency of fibers to float such materials and prevent thorough settlement or separation by the usual methods. If it is desired to accomplish such a washing action, the thickening and pumping equipment and settling capacity for the white water should, of course, be laid out with this object in mind. We advance this suggestion as being a general thought which may be worthy of consideration, although any such apparatus should follow our system and has no other relation to it.

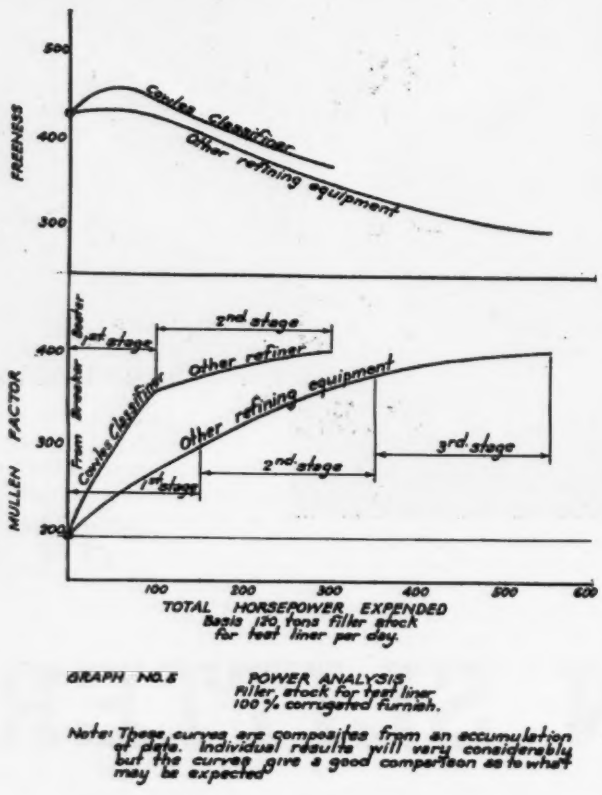


Fig. 5

## Effect on Freeness and Mullen Factor

The progressive effect of defibering and refining breaker beater stock on its freeness and Mullen factor is perhaps one of the most interesting subjects which we have investigated. Our data is still incomplete and we feel that we are a long way from getting at the bottom of the subject. One of our greatest handicaps has been the difficulty of obtaining reliable data, especially when operating on a commercial scale. Certain trends have, however, been noted which always appear to prevail. These trends appear on our Fig. 5. These curves attempt to analyze what happens to the stock as it passes through the refining operation particularly with regard to freeness and mullen factor. Data was obtained by sampling at different stages in the process. For example, after the breaker beater, after the first, second and third Jordans, also after a Cowles Classifiner and after the Jordans which followed it. The Cowles Classifiner was also operated at different speeds so that data was obtained when its power consumption varied between 36 h.p. and 100 h.p., all for a capacity of about 120 tons per day. At the higher speeds there was, of course, much more recycling and much more refining action on the fibers. The freeness[2] of these specimens was determined and hand sheets were made up from which the Mullen factor[2] was determined. This data was then plotted against total horse power consumed in the refining operation up to the stage, where the sample in question was taken.

The initial rise in the freeness curves is of interest. We have explained this by the assumption that undefibered stock, as it appears in breaker beater stock tends to effect the reading of the freeness tester,[2] so that an abnormally low reading is obtained and so that as defibering progresses there is a tendency of the freeness reading to go up. This was almost invariably so with stock from the Cowles Classifiner and with this device a great many readings were taken under varying conditions. We were not able to obtain as good an assortment of readings with other types of refining apparatus and this portion of this curve is more or less interpolated.

We explain the higher freeness of the Cowles refined stock as shown in Fig. 5 in several ways. First of all, it is obvious that the stock is handled rapidly and without doing much of any work on the individual fibers. This is because the large portion which is already defibered when the stock enters the machine passes through the screens immediately. Secondly the remainder passes through the screens progressively as fast as the undefibered bits of paper break up. So if the machine is run at minimum speed and minimum consistency we obtain almost a pure defibering action and an actual rise in apparent freeness. We have such a condition when we operate the machine at about 285 r.p.m. with a power input of 36 h.p. to handle 120 tons per day at 1.5 per cent consistency. Under these conditions there will be practically no recycling; very little stapling of fibers in the holes of the screens and consequently very little work will be done on the fibers. As a matter of fact, there could be very little refining action with such a low power consumption yet the machine will do a good defibering and stock clarification job under these conditions. There will also naturally be a comparatively small increase in Mullen factor, about as indicated on this curve, which is probably chiefly due to the defibering action. It will be noted that the Mullen factor increased only 80 points at 36 h.p. whereas when we were running the machine at 370 r.p.m., and recycling

[2]See note at end of this paper.

# APPLETON VORTEX BEATER

Prepares stock for the paper machine in less time » at higher consistencies » in greater volume » with much less power » in half the space » at lower cost.. The Appleton Vortex Beater invites a thorough examination and comparison of its performance and advantages.

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a considerable amount, running at a consistency of about 2 per cent and consuming about 90 h.p. the Mullen factor increased over twice as much. As a matter of fact, this stock was pretty well refined and not a great deal more need have been done to it. We did not run regularly this way because our motor was overloaded and we did not like the idea of forcing the machine and grinding dirt and trash into the stock.

As previously mentioned it seems best to us to operate these machines primarily to clarify and defiber when handling a demand of much over 100 tons per day, but this data indicates that a decided refining action may be obtained when operating on clean, defibered stock and with this purpose expressly in mind so that suitable adjustments may be made.

### Refining Action

The refining action is undoubtedly due to a hammering by the scrapers of fibers which staple in the holes of the screens and form projecting bundles when the machine is operated in this manner.

We can understand that a very considerable refining action may be established in this manner if the consistency and hole size is so adjusted that the holes plug during the time which elapses between passages of scrapers over the holes, which, of course, clear the holes as they pass by. This plugging of the holes is accomplished by the rapid flow of stock by and through the holes with a rapid deposition of fibers on the receiving edges of the holes, when the consistency and hole size are properly adjusted to each other. In this manner fibers are definitely located in the path of the advancing edges of the scrapers. Now each hole can be swept by a scraper from 1,000 to perhaps 2,000 times per minute and there are a great many holes in a set of screens so that a decided action can be set up which differs from the usual method of refining by the fact that in a Cowles Classifiner the fibers are definitely collected and held at the point of impact whereas in the usual refining action the fibers are usually simply caught at random between bars which are grinding together.

It may be that the comparatively small freeness drop which seems to accompany this action is caused by the fact that the scrapers in our present machine strike a comparatively light blow and that the fibers are therefore bruised and softened without being cut or badly damaged. We can make no positive statements nor predictions for we have much still to learn. We have, however, obtained allowance of very broad patent claims on this method of refining and the subject is a very interesting one to us, so, although they are very preliminary, I am passing our thoughts along. If any of you are disposed to help us in this work, or if you have any helpful suggestions, or if there are any questions, we would much appreciate hearing from you.

Before leaving this subject we would again like to make it clear that this refining action is quite different from the present use of the Classifiner. We obtain a comparatively small amount of refining action unless we make adjustments with this objective specifically in mind and, so far, commercial operations have not regularly been aimed in this direction.

### Fiber Classification

In our early work we observed that when screens with very small holes (1/16 inch diameter and less) were used, short fibers passed through the holes very readily and long fibers were held back. Later we made a commercial run using a screen having 1/16 inch diameter holes on one side of the Classifiner and a screen having 3/16 inch diameter holes on the other side. Ordinary breaker beater stock was fed into the machine at about the usual rate. About 1.5 tons per hour of stock was passed through the fine screen and about 3 tons per hour of stock was passed through the coarse screen. These two grades were then mixed together again, as we had no practical use for such quantities of the two fiber classifications. The following data was obtained from specimens of the resulting mixture and from each of the two grades which left the Classifiner before they were again mixed together.

COMPARISON OF STOCK FROM COWLES CLASSIFINER WITH 1/16 AND 3/16 INCH SCREENS

| Samples from | Per cent consistency | Freeness cc. | Burst per cent points | Tear per cent points |
|---|---|---|---|---|
| 1/16 inch screens | 0.89 | 215 | 33.9 | 17.3 |
| 3/16 inch screens | 2.96 | 360 | 26.1 | 19.0 |
| Mixture | 1.57 | 370 | 28.4 | 17.8 |

CLASSIFICATION OF FIBERS

| Samples Fractions | 1/16 inch screens | 3/16 inch screens | 1/16 inch and 3/16 inch screens |
|---|---|---|---|
| Retained on 14 mesh | 0.9% | 9.5% | 8.7% |
| Retained on 28 mesh | 15.5 | 41.6 | 38.2 |
| Retained on 48 mesh | 13.3 | 11.7 | 12.4 |
| Retained on 100 mesh | 10.2 | 11.5 | 13.1 |
| Retained on 200 mesh | 2.5 | 1.0 | 2.5 |
| Passed 200 mesh | 57.6 | 24.7 | 25.1 |

There are some discrepancies in this data but a definite trend is indicated which was all that we expected from this preliminary experiment.

It also appears that one grade of crude stock could be split up into several classifications. For example we could take long fibers out of the outlet for rejected stock and two other grades from the two screens. We should also be able to regulate or control the fiber lengths and the completeness of the separation quite effectively by screen design, rate of withdrawal from each outlet and regulation of the consistency of the incoming stock. In this latter connection it will be evident that if the consistency is low, most of the water can be made to pass through the fine screen and it will carry short fibers with it.

It is also conceivable that we may be able to operate a classifiner so that a decided refining action will be set up while the classifying action is going on.

We are speculating as to what, if any, practical use there may be for such an application and we would appreciate any suggestions.

*Note:* The special terms used in this paper are as follows:

Freeness—Freeness is the rate of drainage of water from stock. Four grams of oven-dry stock is used per 1,000 cc. of water at 68 deg. F. for freeness on the Williams' freeness tester.

Classification of Pulp, (Johnson Classifier)—Ten grams of oven-dry pulp were used for classification of each sample. Six minutes' period run for classifying each fraction separating the 14 fraction first.

Strength Expression:

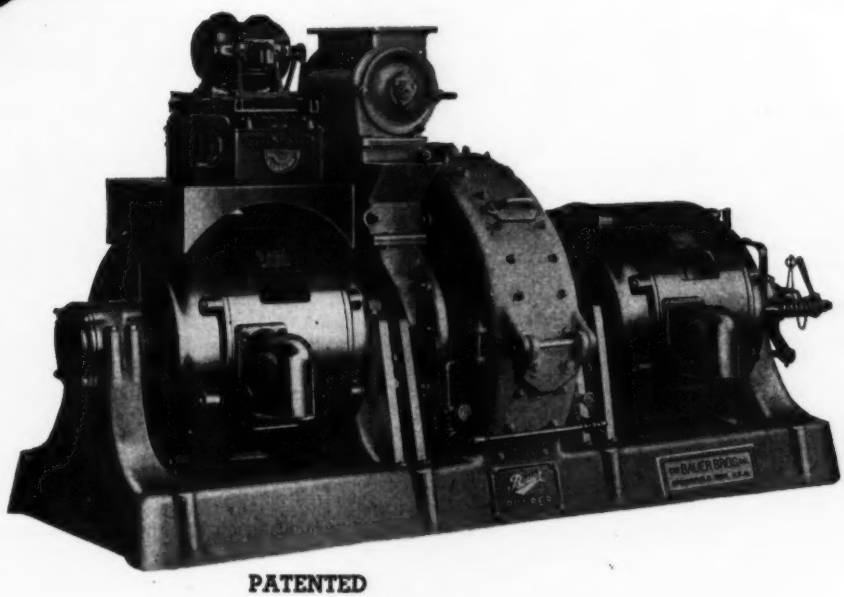
$$\text{Mullen factor or } 30.22 = \frac{\text{(Area in sq. in. of ream or 414,720) (Pound equiv. of gram or .022046)}}{\text{(Area 5½x5½ sheet or 30.25)}}$$

$$\text{Burst in per cent points} = \frac{\text{(Gage reading) (100)}}{\text{(Weight of sheet in grams) (30.22)}}$$

$$\text{Tear in per cent points} = \frac{\text{(Tear for two sheets) (100)}}{\text{(Weight of sheet in grams) (30.22)}}$$

The results are expressed on 24x36—480 ream basis.
The factor 30.22 converts the gram weight of a 5½x5½ sheet to a basis weight on a 24x36—480 ream.

Bauer



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# Pulpers and Fibrators

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U. S. A.

# Insulation Specifications for the Paper Industry*

By J. W. Hemphill[1]

When the Chairman of the Committee on Materials of Construction advised the writer that we were to prepare data on non-metallic materials entering into paper mill construction we were at a loss to know just where to start. A survey of the situation revealed the fact that from 30 to 40 per cent of the conversion cost in making paper was tied up in the production and utilization of steam.

We also found the paper mills installing higher pressure steam generating plants and new chemical equipment, particularly in the recovery plants, all of which necessitates more specialization in insulating materials.

Your committee feels that some real service can be given the paper industry by presenting a foundation upon which to build real data relative to insulating specifications. Your criticisms are requested and the receipt of additional data that can be added to complete the specification will be very much appreciated.

In the selecting of insulating materials certain inherent characteristics are necessary to make them adaptable. In the first place they must be in such form as to be easily applied. For handling temperatures above that of atmosphere, insulations must have heat-resisting qualities sufficient to withstand successfully the highest temperatures to which they will be applied. They must be strong and durable to assure long life.

The ability of commercial insulating materials to retard the flow of heat depends primarily upon the small voids or relatively dead air spaces which they contain. The voids must be enclosed and so small that circulation within them and radiation across them will be at a minimum. Small void size is particularly important at high temperatures because of the rapid increase in convection and radiation losses with rise in temperature.

For the low temperature field which is relatively of minor importance to the paper industry we find insulations made from organic and inorganic materials being widely used. However, since our consideration is chiefly with temperatures above atmospheric we shall stress only those materials commonly known as heat insulations. From such basic mineral products as asbestos, magnesium and calcium carbonate, diatomaceous silica, mineral wool made either from argillaceous limestone or various slags, mica, monohydrate bauxite, and processed clays, are made insulations in the form of sectional pipe covering; insulating sheets, blocks, bricks and blankets; insulating cements, fillers and finishes; and insulating boards, papers and felts. It is rather inevitable that many of these insulating materials are suitable for the same temperature field and they have certain inherent characteristics that may warrant their use on many different applications. However, your Committee has set up certain standard specifications for insulations which have been tested out in the field over a period of years and have proven their effectiveness.

There seems to exist some confusion relative to terms commonly used to express the measure of effectiveness of insulating materials. It has been thought advisable to record here simple definitions of these terms.

*Conductivity*—Conductivity is a measure of the rate of flow of heat through a given material. It is generally expressed in B.t.u. per square foot per 1 inch of thickness, per degree temperature difference between surfaces per hour. Conductivity is an inherent property of the material and remains constant regardless of thickness.

*Heat Transmission*—Heat transmission is the measure of rate of heat flow from one surface through the intervening materials to the air immediately contacting the outside surface and takes into consideration surface resistance. It is usually expressed in B.t.u. per square foot or linear foot of pipe per degree temperature difference per hour. The rate of heat transmission through a thin layer of material is much greater than through a thick layer of the same material or combination of materials.

The term *Efficiency* is sometimes applied to insulating materials. It is expressed as the per cent of heat saved by insulation over bare surface loss. It is obtained by subtracting the heat loss through the insulation from the heat loss of uninsulated surface and dividing the difference by the heat loss of the uninsulated surface.

### Pipe Insulation Specifications for Heated Lines

The thicknesses below represent standard practice in general use on heated lines.

Exceptional conditions may make necessary thicker insulation. On outside piping it is customary to use insulation ½ inch thicker than that on indoor lines. Thickness specifications given below are for indoor lines.

TABLE I

RECOMMENDATIONS FOR TEMPERATURES TO 600 DEG. F.

| Thickness of Insulation, 85 Per cent Magnesia | | | | Thickness of Insulation, Laminated Asbestos Felt | | |
|---|---|---|---|---|---|---|
| Pipes larger than 4" | Pipes 2" to 4" | Pipes smaller than 4" | Temperature, deg F. | Pipes larger than 4" | Pipes 2" to 4" | Pipes smaller than 2" |
| Std. | Std. | Std. | Below 212 | 1" | 1" | 1" |
| Std. | Std. | Std. | 212 to 266 | 1" | 1" | 1" |
| 1½" | Std. | Std. | 267 to 337 | 1½" | 1" | 1" |
| 2" | 1½" | Std. | 338 to 387 | 2" | 1½" | 1" |
| Dbl. Std. | 2" | 1½" | 388 to 499 | 2½" | 2" | 1½" |
| 3" | Dbl. Std. | 2" | 500 to 599 | 3" | 2½" | 2" |
| | | | 600 to 700 | 3½" | 3" | 2" |

In general, all pipes, fittings and flanges at temperatures below 600 deg. F., except small fittings which are insulated with Asbestos cement, should be insulated with 85 per cent Magnesia or laminated asbestos felt insulation to the thickness given in the table. Laminated asbestos felt insulation may be used, where service conditions warrant, up to 700 deg. F.

TABLE II

RECOMMENDATIONS FOR TEMPERATURES ABOVE 600 DEG. F.

| Temperatures | 600-699 Deg. F. | | 700-799 Deg. F. | | 800-1000 Deg. F. | |
|---|---|---|---|---|---|---|
| | Thickness of Insulation | | Thickness of Insulation | | Thickness of Insulation | |
| Pipe Size | Moulded High Temperature Insulation | 85 Per cent Magnesia | Moulded High Temperature Insulation | Laminated Asbestos Felt or 85 Per cent Magnesia | Moulded High Temperature Insulation | Laminated Asbestos Felt or 85 Per cent Magnesia |
| 1½" & Smaller | 2" | .... | 2" | .... | 2" | .... |
| 2" | 1¼" | 1½" | 1¼" | 2" | 1¼" | 1½" |
| 2½" | 1⅛" | 1½" | 1⅛" | 2" | 1⅛" | 1½" |
| 3" | 1⅛" | 1½" | 1⅛" | 2" | 2⅛" | 1½" |
| 3½" | 1⅛" | 1½" | 1⅛" | 2" | 1⅛" | 1½" |
| 4" | 1⅛" | 1½" | 1⅛" | 2" | 2⅛" | 1½" |
| 4½" | 1⅛" | 2" | 1⅛" | 2½" | 1⅛" | 2" |
| 5" & larger, approx. | 1½" | 2" | 1½" | 2½" | 2" | 2" |

All pipes 1.5 inches and smaller at temperatures above 600 deg. F. (or above 700 deg. F. if laminated asbestos felt insulation is used) should be insulated with a single

* Presented at the Annual Meeting of the Technical Association of the Pulp and Paper Industry, Waldorf-Astoria Hotel, New York, N. Y., Feb. 17 to 20, 1936.

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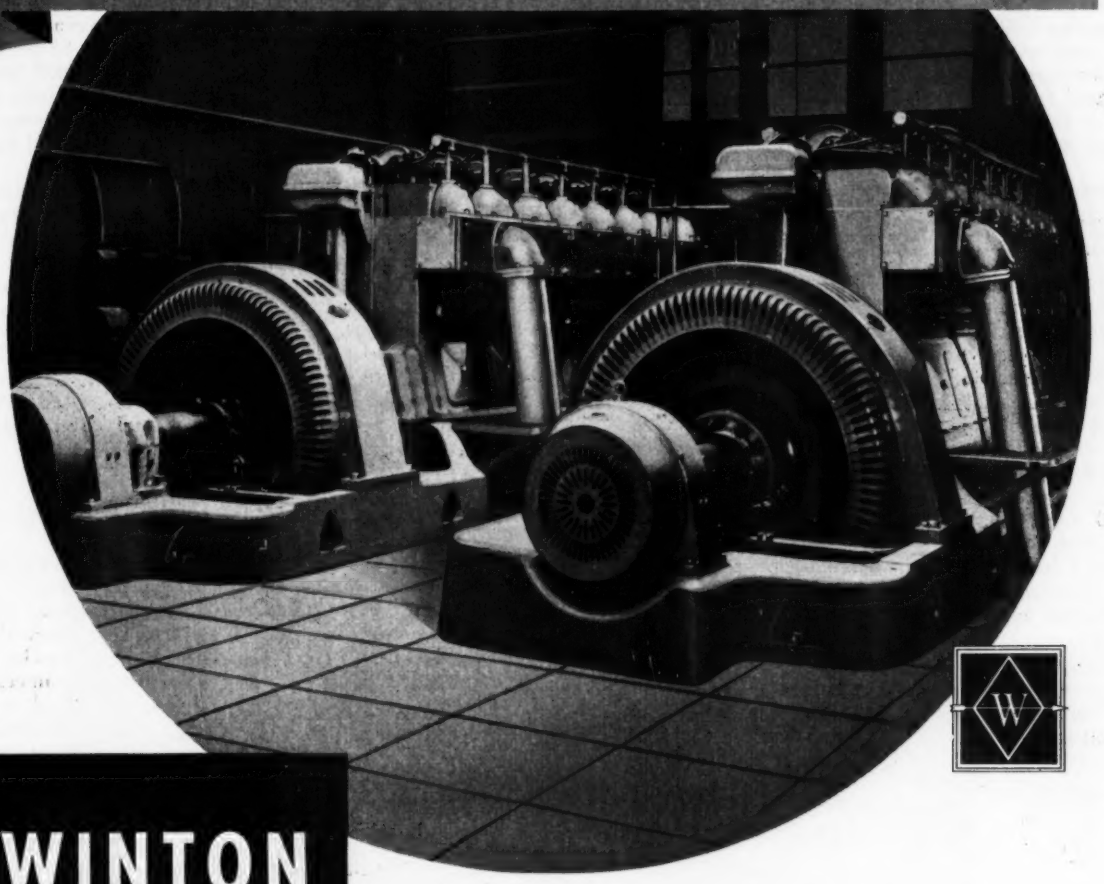

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layer of moulded high temperature sectional pipe insulation 2 inches thick, small fittings to be insulated with asbestos cement. For fittings larger than 1.5 inches at temperatures above 600 or 700 deg. F. use same thickness and combination of insulations as shown in Table II.

**Finish of Insulation**

All insulation on piping indoors shall be finished with a jacket of 8-oz. canvas, sewed on over rosin-sized paper or asbestos paper, sized with glue and painted with two coats of lead and oil paint.

Insulated pipe lines out of doors should be protected with a waterproof jacket made from a 55-pound asphalt saturated felt fastened by rings of heavy non-corroding wire on 4 inch centers. Metal jackets are suggested over all lines subjected to rough usage.

**Insulation Recommendations for Power Plant Equipment**

*Note:* The specifications cover the most widely accepted forms of insulations. It is to be recognized that other types of insulating materials may be substituted where the physical properties of said materials are suitable.

Boiler Shells and Drums: H.R.T., fire-box type and the drums of water-tube boilers shall be insulated with 85 per cent magnesia blocks, 1 inch thick, for steam pressures up to 25 pounds; 1.5 inch thick, for pressures up to 100 pounds; and 2.5 inches thick for pressures over 200 pounds. All insulation to be finished with ½ inch thick coat of asbestos cement troweled over surface.

Steam Turbines at temperatures below 300 deg. F. shall be insulated with 85 per cent magnesia blocks 1.5 inch thick; 300 to 400 deg. F., 2 inches thick; 400 to 600 deg. F., 3 inches thick. Over 600 deg. F., 1.5 inch moulded diatomaceous silica and asbestos blocks followed by 1.5 inch 85 per cent magnesia blocks. All insulation to be finished with ½ inch thick coat of asbestos cement troweled over surface.

*Alternate—Removable Asbestos Blanket Insulation for Steam Turbines*—Blankets to be made from asbestos cloth in envelope form filled with brown asbestos fiber and tufted with copper wire. Suggested thickness of asbestos blankets:

TABLE III

| Temperature, deg. F. | Recommended Thickness |
|---|---|
| Below 300 | 1½" |
| 300 to 400 | 2" |
| 400 to 500 | 2½" |
| 500 to 600 | 3" (2—1½" layers) |
| Over 600 | 4" (2—2" layers) |

Feed-water heaters shall be insulated with 1.5 inch 85 per cent magnesia blocks finished with ½ inch thick coat of asbestos cement troweled over surface.

Pump cylinders and chests shall be insulated with 2 inch 85 per cent magnesia blocks finished with ½ inch thickness of asbestos cement troweled over insulation.

TABLE IV

BRICK-SET BOILERS—BLOCK INSULATION RECOMMENDATIONS FOR TYPICAL WATER-TUBE BOILERS

| Type of Boiler | Side Walls | | | Rear Wall | Top |
|---|---|---|---|---|---|
| | Front Wall | From front wall to bridge wall | To rear of bridge wall | | |
| B & W Type | 3" Moulded Diatomaceous Silica & Asbestos-Magnesia Combination | | 1½" Magnesia | None | 2½" Magnesia |
| Stirling Type | 3" Moulded Diatomaceous Silica & Asbestos-Magnesia Combination | | 3" Magnesia (2 layers) | 1½" Magnesia | 3" Moulded Diatomaceous Silica & Asbestos-Magnesia Combination |
| Springfield Type | None | 3" Moulded Diatomaceous Silica & Asbestos-Magnesia Combination | | | Ditto |

All insulation to be finished with ½ inch asbestos insulating cement, or, with asbestos sheet or steel casting.

On new settings a veneer of 4.5 inch calcined diatomaceous-silica brick may be bonded into the outside of the fire brick every fifth course vertically. On new settings of H.R.T. boilers and small water-tube boilers, a "core wall" of 4.5 inch natural diatomaceous silica brick is often laid between the fire brick and red brick.

Water-cooled boiler wall insulation: Due to variation in water wall construction many different forms of insulation may be used. Boiler water walls may be insulated with 4 inch thickness of 85 per cent magnesia, or if the temperature is above 600 deg. F. high temperature insulating blocks either alone or in combination with 85 per cent magnesia are used. Insulating cements are used for leveling surfaces and are sometimes applied as the main insulation although such applications are not to be recommended due to lower thermal efficiency. Insulation should be protected with a steel or asbestos sheet outer casing.

Air-cooled boiler wall insulation: Molded asbestos fiber sheets 1 inch thick bolted to inside of steel or rigid asbestos sheet casing and protected on the inner airpassage surface with ¼ inch thick asbestos millboard.

Boiler bases: For boiler bases at least 4 inches of calcined diatomaceous concrete is recommended under one or two layers of fire brick.

Boiler tube doors should be insulated with 2 inch moulded asbestos fiber sheets, protected with ¼ inch asbestos sheet millboard. If the doors are insulated before they are hung, they may be laid flat and filled with calcined diatomaceous concrete.

BREECHINGS AND STACKS

Breechings (insulated inside)—All breechings should be insulated on the inside where possible.

Inside insulation to be 2 inches thick natural or calcined diatomaceous silica and asbestos block protected with a ½ inch finish coat of semi-refractory cement.

Breechings (insulated outside)—Insulation shall be 2 inch thickness of 85 per cent magnesia blocks for temperatures under 600 deg. F. For higher temperatures insulation shall be 2 inch thickness of natural or calcined diatomaceous silica and asbestos block. All insulation to be finished with ½ inch thickness of asbestos cement.

Breeching insulation exposed to weather should be protected with a ¼ inch thick troweled coat of a compound made from asbestos fiber and asphalt.

Stacks—Insulation on inside of stack shall be approximately 2 inch thick natural or calcined diatomaceous silica bricks or blocks finished with a ½ inch thickness of semi-refractory cements or 2 inch thickness of vitrified asbestos cellular sheets.

**Special Equipment**

Rotary boilers—Insulation to be 1.5 inch thick 85 per cent magnesia blocks finished with ½ inch asbestos cement. Rock or mineral wool cement applied approximately 2 inches thick may be used.

Soda and sulphate pulp digesters—Insulation to be 1.5 inches thick 85 per cent magnesia blocks finished with ½ inch asbestos cement.

UNLINED SULPHITE DIGESTERS

Permanent insulation—All exposed surfaces shall be insulated with 1.5 inches thick 85 per cent magnesia blocks securely wired in place and finished with a ½ inch thick coat of asbestos cement. All insulation to be protected with a ¼ inch troweled coat of acid- and water-proofing cement made from emulsified asphalt and asbestos fiber.

*Note:* The above general specifications are given in the belief that unlined alloy steel sulphite digesters may be used commercially in the future.

Paper machine steam cylinder driers—Ends of cylinder driers to be insulated with 1.5 inches thick rock or mineral

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wool insulating cements and finished with a ¼ inch thickness of asphalt and asbestos fiber compound troweled over the surface.

De-inking equipment—Insulation shall be 1.5 inches thick 85 per cent magnesia blocks finished with a ½ inch coat of asbestos cement troweled in place. Where deemed advisable insulation may be further protected by means of asbestos and portland cement sheets bolted to steel work.

Paper machine hood insulation—Where increased drying efficiency is desired the insulation of the outside of the machine hood is recommended. The insulation shall be 85 per cent magnesia blocks 1 inch thick finished with ½ inch thick coat of asbestos cement troweled in place.

*Waste heat boiler* (Water tube type)—standard insulation specification for direct-fired boilers applies to waste heat boiler equipment.

Causticizing tanks—Mixing tanks shall be insulated with 1.5 inches 85 per cent magnesia blocks applied to sides of tanks and finished with ½ inch thick coat of asbestos cement troweled in place.

Storage tanks shall be insulated on top, bottom and sides with 1.5 inches thick 85 per cent magnesia blocks finished with a ½ inch thick coat of asbestos cement troweled in place.

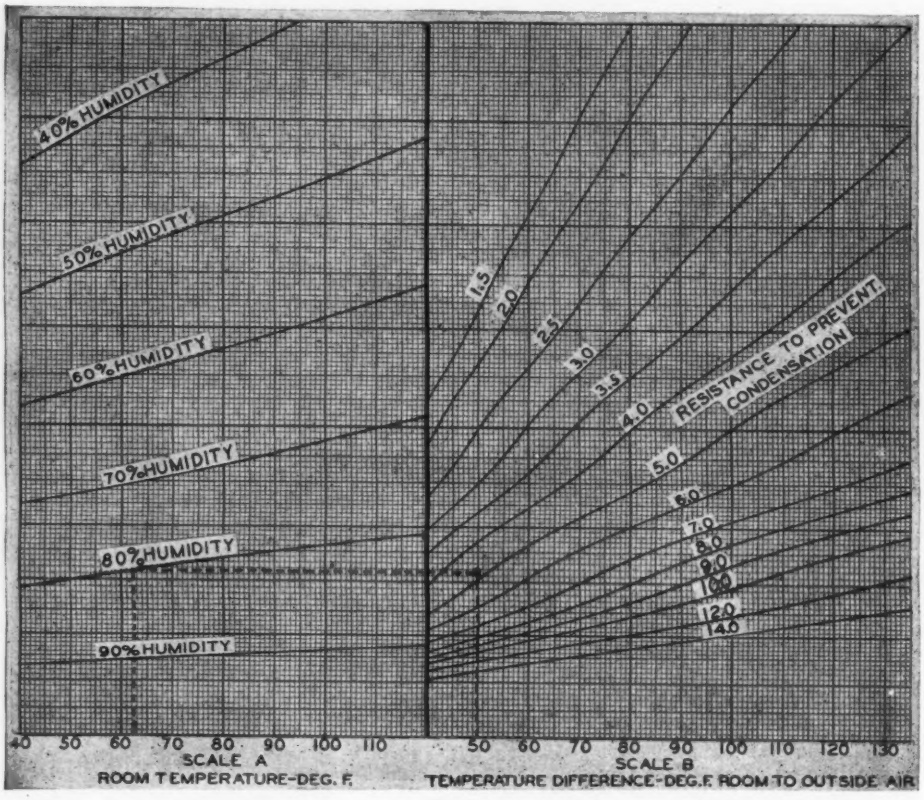


FIG. 1
Chart to determine resistance required to prevent condensation.

### Insulation Specifications for Recovery Apparatus

ROSS-WAGNER RECOVERY SYSTEM FOR SODA AND SULPHATE MILLS

*Wagner Furnace:* Furnace shell shall be insulated with diatomaceous and asbestos fiber blocks. The location and thickness of insulation shall be in accordance with standard practice used by designers and builders of equipment.

Asbestos cement shall be applied in the expansion joints of lining and also along edge of top of furnace to provide a suitable seal.

*Top of Furnace*—Over tube tiles shall be laid 2 inches thick 85 per cent magnesia blocks finished with a ½ inch thickness of asbestos cement troweled in place.

*Ducts*—All ducts leading to waste heat boiler shall be insulated on outside with 2 inches thick diatomaceous silica and asbestos fiber blocks and finished with ½ inch thickness of asbestos cement.

### Insulation Specifications for Water Pipes Exposed to Freezing

All cold water, compressed air, soil and waste pipes and fittings exposed to freezing temperatures shall be insulated with built-up hair felt insulation of the required number of layers. Each layer of hair felt to be 1 inch thick and secured to the pipe with heavy jute twine. Over each layer of hair felt shall be applied a layer of 15 pound asphalt impregnated felt secured in place with twine.

All pipes and fittings shall be finished with either a canvas jacket sewed on or with asphalt felt weather-proof jacket with all joints sealed with an asphaltic cement.

Since it is impossible to give definite specifications as to thickness of insulation that will protect piping under all conditions the data on freezing of water in pipes given in the following table should be used as a guide in determining insulation thickness. The figures given show the length of time required for the water in a pipe to be cooled from 42 to 32 deg. F. with a temperature difference between water and air of 60 deg. F. which would correspond to an air temperature of about 20 below zero.

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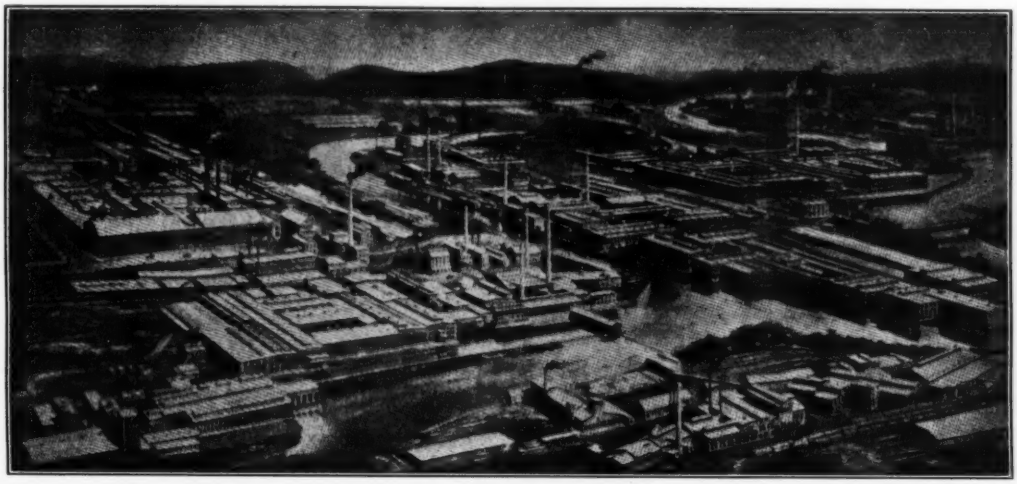

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Water should not be allowed to remain stationary for longer than one-half of the time given in table.

Where water must remain stationary in pipes subjected to temperatures below freezing indefinitely the surest way of protecting line is to provide a small steam or hot water line along side of water line and enclose both in the insulation.

*Note:* Table indicates time required to reduce water to 32 deg. F. Longer time will be required to freeze the water but all lines will be in danger.

TABLE V

DATA ON FREEZING OF WATER IN PIPES

| Pipe size, inches | Insulation, No. layers each 1 in. thick | B.t.u. per deg. temp. diff., per hour per lin. ft. | Hours to cool to freezing point | Pounds water flow per hr. per lin. ft. to prevent freezing |
|---|---|---|---|---|
| ½ | 2 | .0895 | .417 | .537 |
| | 3 | .0747 | .500 | .448 |
| | 4 | .0660 | .565 | .396 |
| 1 | 2 | .1125 | .825 | .675 |
| | 3 | .0911 | 1.02 | .548 |
| | 4 | .0798 | 1.16 | .480 |
| 1½ | 2 | .1400 | 1.40 | .840 |
| | 3 | .1126 | 1.74 | .676 |
| | 4 | .0972 | 2.02 | .583 |
| 2 | 2 | .1586 | 1.94 | .952 |
| | 3 | .1244 | 2.48 | .747 |
| | 4 | .1063 | 2.90 | .638 |
| 3 | 2 | .2062 | 3.25 | 1.237 |
| | 3 | .1572 | 4.27 | .943 |
| | 4 | .1322 | 5.08 | .793 |
| 4 | 2 | .2450 | 4.55 | 1.470 |
| | 3 | .1850 | 6.02 | 1.110 |
| | 4 | .1548 | 7.20 | .929 |
| 5 | 2 | .2887 | 5.92 | 1.733 |
| | 3 | .2146 | 7.96 | 1.289 |
| | 4 | .1764 | 9.69 | 1.059 |
| 6 | 2 | .3302 | 7.35 | 1.981 |
| | 3 | .2434 | 9.88 | 1.460 |
| | 4 | .1984 | 12.20 | 1.191 |
| 8 | 2 | .4100 | 10.05 | 2.460 |
| | 3 | .2960 | 13.90 | 1.776 |
| | 4 | .2390 | 17.25 | 1.434 |
| 10 | 2 | .4930 | 13.00 | 2.960 |
| | 3 | .3536 | 18.10 | 2.122 |
| | 4 | .2830 | 22.70 | 1.698 |
| 12 | 2 | .5720 | 15.80 | 3.432 |
| | 3 | .4090 | 22.20 | 2.454 |
| | 4 | .3222 | 28.10 | 1.933 |

**Insulation Specifications for Cold Water Lines**

(a) To keep water in lines cold.

(b) To prevent atmospheric moisture condensation on cold water lines.

TABLE VI

TABLE SHOWING REQUIRED THICKNESS OF INSULATION

| Pipe Temp., Deg. F. | Air Temperature Under 100 deg. F. Humidity Range Per cent | Thickness Pipe Insulation | Thickness Hair Felt on Fittings |
|---|---|---|---|
| Over 50 | Under 75 | 1" | ¾" |
| Over 50 | 75 to 80 | 1½" | 1½" |
| 32 to 50 | Under 75 | 1½" | 1½" |

**Insulation to Prevent Moisture Condensation Under Roof Deck**

The thickness of insulation required on the deck of a roof to prevent condensation depends upon such factors as room temperature, humidity of the atmosphere in room,

TABLE VII-A

RESISTANCES OF UNINSULATED ROOF STRUCTURES COVERED WITH SMOOTH-SURFACED BUILT-UP ROOFS

| | Resistance |
|---|---|
| Concrete (stone) 4" thick | 1.21 |
| Concrete (stone) 5" thick | 1.29 |
| Concrete (stone) 6" thick | 1.37 |
| Gypsum, 3" thick, solid | 1.91 |
| Gypsum, 4" thick, solid | 2.25 |
| Steel | 0.89 |
| Wood, ¾" thick (nominal 1") | 1.87 |
| Wood, 1½" thick (nominal 2") | 2.92 |
| Wood, 2½" thick (nominal 3") | 4.17 |

TABLE VII-B

RESISTANCES OF MATERIALS AND SURFACES

| | Resistance |
|---|---|
| Cement tile (precast) | 0.08* |
| Concrete (cinder) | 0.19* |
| Concrete (stone) | 0.08* |
| Corkboard | 3.33* |
| Gypsum | 0.34* |
| Gypsum (aerated, 24 lb. per cu. ft.) | 1.30* |
| Insulating Board | 2.78* |
| Asphalt Impreg. Min. Wool Sheets | 3.03* |
| Asbestos Fiber and Cement Board ¼" Thick Flat or Corrugated | 0.06** |
| Wood (actual thickness) | 1.25* |
| Built-up Roof, Smooth-Surfaced | 0.28** |
| Inside surface resistance | 0.61 |
| Outside surface resistance | 0*** |

* These resistances are per inch. Multiply by thickness in inches to obtain total resistance.

** Total resistance, based on actual thickness.

*** Outside surface resistance will vary, but is taken at 0 to allow for the most unfavorable conditions which obtain when surface is exposed to wind and rain.

Resistances in the above table furnished by Johns-Manville and the A.S.H. & V.E. Guide, 1935 edition.

TABLE VIII.—HEAT LOSS FROM BARE SURFACES

**Temperature differences 50 to 400 deg. F. See Table IX for higher temperatures.**

Losses given in B.t.u. per hour, per linear foot of bare pipe and per square foot of bare flat surface, at various temperature differences.

(For finding losses at temperatures between those shown, the B.t.u. differences per degree are given in light-face type between the main columns)

| Nominal pipe size, inches | Area of pipe surface per lin. ft., sq. ft. | Temperature difference, deg. Fahr. 50° | | 100° | | 150° | | 200° | | 250° | | 300° | | 350° | | 400° | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Heat loss in B.t.u. per linear ft. per hour | | | | | | | | | | | | | | | |
| ½ | .220 | 21.5 | .52 | 47.3 | .64 | 79.2 | .76 | 117.3 | .90 | 162.3 | 1.06 | 215.2 | 1.28 | 279.1 | 1.52 | 355.1 | 1.73 |
| ¾ | .275 | 26.8 | .64 | 59.0 | .79 | 98.6 | .96 | 146.8 | 1.11 | 202.1 | 1.33 | 268.5 | 1.58 | 347.6 | 1.89 | 442.2 | 2.20 |
| 1 | .344 | 33.6 | .81 | 74.0 | 1.00 | 123.8 | 1.19 | 183.4 | 1.41 | 253.7 | 1.67 | 336.4 | 1.98 | 436.5 | 2.37 | 555.2 | 2.71 |
| 1¼ | .435 | 42.5 | 1.01 | 93.6 | 1.26 | 156.6 | 1.51 | 231.9 | 1.78 | 320.8 | 2.09 | 425.4 | 2.53 | 551.9 | 3.00 | 702.1 | 3.42 |
| 1½ | .498 | 48.7 | 1.17 | 107.2 | 1.44 | 179.3 | 1.72 | 265.4 | 2.04 | 367.3 | 2.39 | 487.0 | 2.90 | 631.8 | 3.44 | 803.8 | 3.92 |
| 2 | .622 | 60.9 | 1.46 | 133.9 | 1.80 | 223.9 | 2.15 | 331.5 | *2.54 | 458.7 | 2.99 | 608.3 | 3.62 | 789.2 | 4.29 | 1003.9 | 4.90 |
| 2½ | .753 | 73.4 | 1.76 | 161.6 | 2.18 | 270.4 | 2.60 | 400.3 | 3.07 | 553.9 | 3.61 | 734.5 | 4.37 | 952.8 | 5.19 | 1212.1 | 5.99 |
| 3 | .917 | 89.6 | 2.15 | 197.3 | 2.66 | 330.1 | 3.17 | 488.8 | 3.75 | 676.3 | 4.41 | 896.8 | 5.33 | 1163.4 | 6.33 | 1480.0 | 7.22 |
| 3½ | 1.047 | 102.3 | 2.46 | 225.3 | 3.03 | 376.9 | 3.62 | 558.1 | 4.28 | 772.2 | 5.04 | 1024.0 | 6.09 | 1328.4 | 7.23 | 1689.9 | 8.24 |
| 4 | 1.178 | 115.1 | 2.77 | 253.5 | 3.41 | 424.2 | 4.07 | 627.9 | 4.82 | 868.8 | 5.67 | 1152.1 | 6.85 | 1494.6 | 8.13 | 1901.3 | 9.27 |
| 4½ | 1.309 | 127.9 | 3.07 | 281.5 | 3.79 | 470.9 | 4.53 | 697.2 | 5.35 | 964.7 | 6.29 | 1279.2 | 7.61 | 1659.5 | 9.03 | 2111.1 | 10.33 |
| 5 | 1.456 | 142.2 | 3.42 | 313.1 | 4.21 | 523.8 | 5.03 | 775.5 | 5.95 | 1073.0 | 7.00 | 1423.0 | 8.46 | 1846.0 | 10.00 | 2348.4 | 11.49 |
| 6 | 1.734 | 169.4 | 4.05 | 371.9 | 5.04 | 623.9 | 6.00 | 923.7 | 7.09 | 1278.1 | 8.34 | 1694.9 | 10.10 | 2198.7 | 12.00 | 2797.1 | 13.68 |
| 7 | 1.996 | 195.0 | 4.71 | 430.4 | 5.79 | 720.0 | 6.92 | 1066.0 | 8.19 | 1475.6 | 9.61 | 1956.0 | 11.66 | 2539.0 | 13.78 | 3228.0 | 15.58 |
| 8 | 2.257 | 220.6 | 5.30 | 485.7 | 6.54 | 812.5 | 7.81 | 1203.0 | 9.23 | 1664.5 | 10.80 | 2207.3 | 13.10 | 2863.6 | 15.60 | 3642.8 | 17.76 |
| 9 | 2.519 | 246.0 | 5.92 | 542.0 | 7.30 | 907.0 | 8.72 | 1343.0 | 10.34 | 1860.0 | 12.10 | 2465.0 | 14.70 | 3200.0 | 17.40 | 4070.0 | 19.73 |
| 10 | 2.817 | 275.4 | 6.62 | 606.2 | 8.16 | 1014.1 | 9.75 | 1501.5 | 11.50 | 2077.5 | 13.60 | 2755.0 | 16.40 | 3574.1 | 19.50 | 4546.6 | 22.17 |
| 11 | 3.073 | 300.0 | 7.26 | 663.0 | 8.92 | 1109.0 | 10.66 | 1642.0 | 12.60 | 2272.0 | 14.76 | 3010.0 | 17.90 | 3905.0 | 21.30 | 4972.0 | 23.94 |
| 12 | 3.338 | 326.0 | 7.86 | 719.0 | 9.68 | 1203.0 | 11.54 | 1780.0 | 13.70 | 2465.0 | 16.02 | 3266.0 | 19.40 | 4235.0 | 23.10 | 5390.0 | 26.22 |
| 14 o.d. | 3.663 | 357.0 | 8.59 | 786.0 | 10.64 | 1318.0 | 12.64 | 1950.0 | 15.00 | 2700.0 | 17.06 | 3580.0 | 21.30 | 4645.0 | 25.20 | 5905.0 | 28.96 |
| 16 o.d. | 4.188 | 408.0 | 9.84 | 901.0 | 12.20 | 1510.0 | 14.50 | 2233.0 | 17.20 | 3095.0 | 20.10 | 4100.0 | 24.40 | 5320.0 | 28.90 | 6765.0 | 32.84 |
| Flat, curved, or cylindrical surfaces | | Heat loss in B.t.u. per sq. ft. per hour 97.5 | 2.35 | 215.2 | 2.90 | 360.0 | 3.46 | 533.0 | 4.10 | 737.8 | 4.80 | 978.0 | 5.83 | 1269.4 | 6.89 | 1614.0 | 7.87 |
| | | Heat loss in B.t.u. per sq. ft. per degree temperature difference per hour 1.950 | | 2.152 | | 2.400 | | 2.665 | | 2.951 | | 3.260 | | 3.627 | | 4.035 | |

* Example: 2" pipe, 235 deg. temperature difference; 235 deg. — 200 deg. = 35 deg.; 35 deg. × 2.54 (B.t.u. per degree) = 88.9 B.t.u. 331.5 + 88.9 = 420.4 B.t.u. loss at 235 deg. temperature difference.

*Note:* Data on heat losses from bare flat, curved or cylindrical surfaces for temperature differences of 900 deg. F. and 1000 deg. F. are given below:

| | 900 deg. F. | 1000 deg. F. |
|---|---|---|
| Heat loss B.t.u. per sq. ft. per hr. | 7830 | 9650 |
| Heat loss B.t.u. per sq. ft. per degree temp. diff. per hour | 8.7 | 9.65 |

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3. Lime Slaking
4. Milk of Lime Degritting
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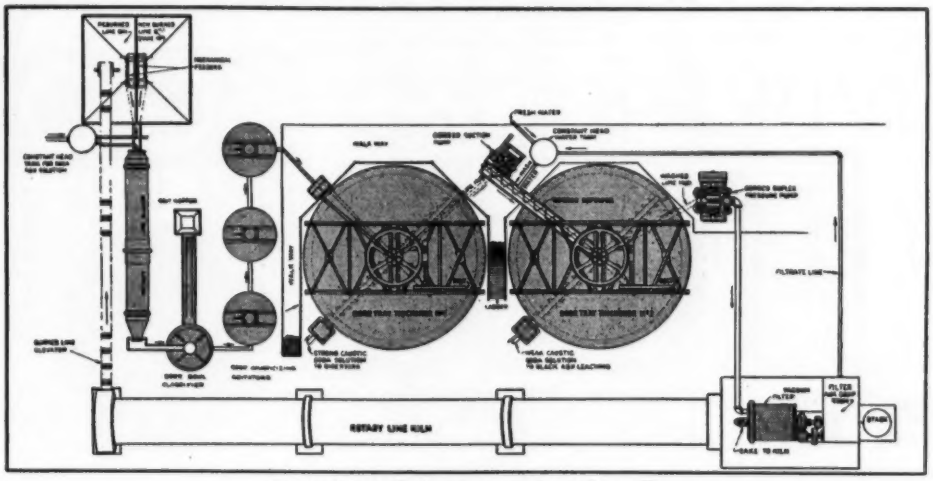
6. Decantation
7. Mud Washing
8. Mud Filtration

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- Oxford Paper Co.
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## TABLE IX.—HEAT LOSS FROM BARE SURFACES

**Temperature differences 450 to 800 deg. F. See Table VIII for lower temperatures.**
Losses given in B.t.u. per hour, per linear foot of bare pipe and per square foot of bare flat surface, at various temperature differences.
(For finding losses at temperatures between those shown, the B.t.u. differences per degree are given in light-face type between the main columns)

| Nominal pipe size, inches | Area of pipe surface per lin. ft., sq. ft. | Temperature difference, deg. Fahr. 450° | | 500° | | 550° | | 600° | | 650° | | 700° | | 750° | | 800° |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Heat loss in B.t.u. per linear ft. per hour | | | | | | | | | | | | | | |
| ⅛ | .220 | 441.6 | 1.99 | 541.2 | 2.16 | 650 | 2.44 | 772 | 2.64 | 904 | 2.86 | 1047 | 3.04 | 1199 | 3.30 | 1364 |
| ¼ | .275 | 552.1 | 2.49 | 676.5 | 2.71 | 812 | 3.08 | 966 | 3.28 | 1130 | 3.58 | 1309 | 3.82 | 1500 | 4.10 | 1705 |
| 1 | .344 | 690.6 | 3.11 | 846.2 | 3.39 | 1016 | 3.82 | 1207 | 4.12 | 1413 | 4.48 | 1637 | 4.76 | 1875 | 5.14 | 2132 |
| 1¼ | .435 | 873.2 | 3.94 | 1070.1 | 4.30 | 1285 | 4.82 | 1526 | 5.20 | 1786 | 5.72 | 2071 | 6.02 | 2372 | 6.50 | 2697 |
| 1½ | .498 | 999.7 | 4.51 | 1225.1 | 4.89 | 1470 | 5.54 | 1747 | 5.94 | 2044 | 6.52 | 2370 | 6.92 | 2716 | 7.38 | 3085 |
| 2 | .622 | 1248.6 | 5.63 | 1530.1 | 6.12 | 1836 | 6.92 | 2182 | 7.42 | 2553 | 8.16 | 2961 | 8.58 | 3390 | 9.30 | 3855 |
| 2½ | .753 | 1511.6 | 6.82 | 1852.4 | 7.83 | 2224 | 8.38 | 2643 | 8.98 | 3092 | 9.82 | 3583 | 10.56 | 4106 | 11.24 | 4668 |
| 3 | .917 | 1840.8 | 8.30 | 2255.8 | 9.04 | 2708 | 10.20 | 3218 | 10.94 | 3765 | 11.96 | 4363 | 12.74 | 5000 | 13.84 | 5692 |
| 3½ | 1.047 | 2101.8 | 9.47 | 2575.6 | 10.33 | 3092 | 11.64 | 3674 | 12.52 | 4300 | 13.70 | 4985 | 14.50 | 5710 | 15.74 | 6497 |
| 4 | 1.178 | 2364.8 | 10.66 | 2897.9 | 11.64 | 3480 | 13.10 | 4135 | 14.10 | 4840 | 15.40 | 5610 | 16.28 | 6424 | 17.72 | 7310 |
| 4½ | 1.309 | 2627.8 | 11.85 | 3220.1 | 12.92 | 3866 | 14.58 | 4595 | 15.70 | 5380 | 17.00 | 6230 | 18.20 | 7140 | 19.60 | 8120 |
| 5 | 1.456 | 2922.9 | 13.18 | 3581.8 | 14.36 | 4300 | 16.20 | 5110 | 17.40 | 5980 | 19.00 | 6930 | 20.20 | 7940 | 21.80 | 9030 |
| 6 | 1.734 | 3480.9 | 15.69 | 4265.6 | 17.12 | 5122 | 19.20 | 6082 | 20.76 | 7120 | 22.68 | 8254 | 24.02 | 9455 | 25.90 | 10750 |
| 7 | 1.996 | 4006.9 | 18.07 | 4910.2 | 19.69 | 5895 | 22.20 | 7005 | 23.90 | 8200 | 26.00 | 9500 | 27.80 | 10890 | 29.70 | 12375 |
| 8 | 2.257 | 4530.8 | 20.43 | 5552.2 | 22.29 | 6667 | 25.06 | 7920 | 27.00 | 9270 | 29.60 | 10740 | 31.00 | 12300 | 33.80 | 13990 |
| 9 | 2.519 | 5056.8 | 22.79 | 6196.7 | 26.86 | 7440 | 28.00 | 8840 | 30.00 | 10340 | 33.00 | 11990 | 34.80 | 13730 | 37.80 | 15620 |
| 10 | 2.817 | 5655.0 | 25.49 | 6929.8 | 27.80 | 8320 | 31.40 | 9890 | 33.40 | 11560 | 37.00 | 13410 | 38.80 | 15350 | 42.20 | 17460 |
| 11 | 3.073 | 6168.9 | 27.81 | 7559.6 | 30.41 | 9080 | 34.20 | 10790 | 36.60 | 12620 | 40.20 | 14630 | 42.40 | 16750 | 46.00 | 19050 |
| 12 | 3.338 | 6700.9 | 30.21 | 8211.5 | 32.97 | 9860 | 37.00 | 11710 | 40.00 | 13710 | 43.60 | 15890 | 46.20 | 18200 | 49.80 | 20690 |
| 14 o.d. | 3.663 | 7353.3 | 33.15 | 9011.0 | 36.18 | 10820 | 40.60 | 12850 | 43.80 | 15040 | 47.80 | 17430 | 50.40 | 19950 | 55.00 | 22700 |
| 16 o.d. | 4.188 | 8407.2 | 37.91 | 10302.5 | 41.15 | 12360 | 46.60 | 14690 | 50.20 | 17200 | 54.80 | 19940 | 57.60 | 22820 | 62.80 | 25960 |
| **Flat, curved or cylidrical surfaces** | | Heat loss in B.t.u. per sq. ft. per hour 2007.5 | 9.05 | 2460.0 | 9.87 | 2953.5 | 11.2 | 3510.0 | 11.96 | 4108.0 | 13.04 | 4760.0 | 13.85 | 5452.5 | 14.95 | 6200.0 |
| | | Heat loss in B.t.u. per sq. ft. per degree temperature difference per hour 4.461 | | 4.920 | | 5.370 | | 5.850 | | 6.320 | | 6.800 | | 7.270 | | 7.750 |

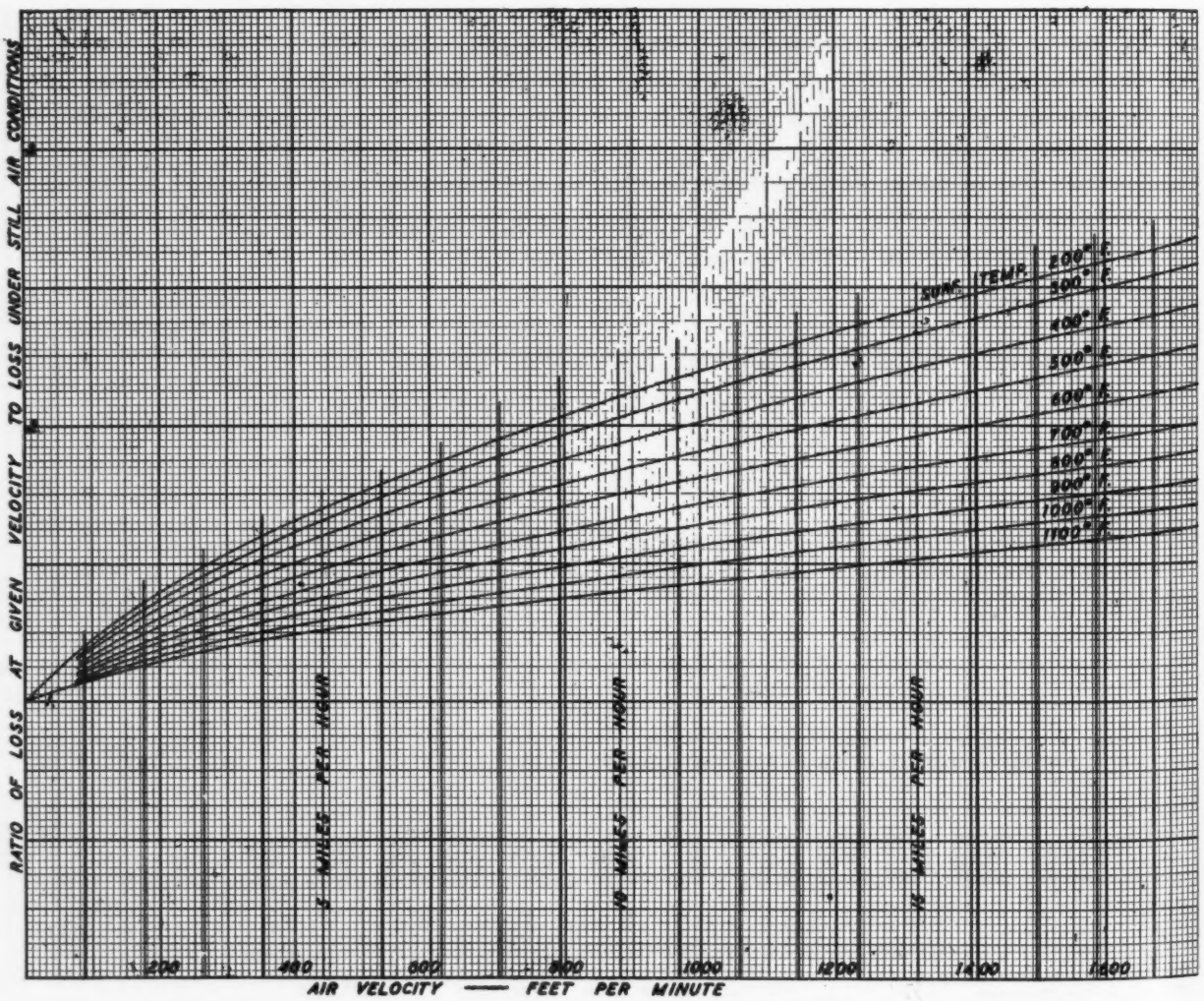
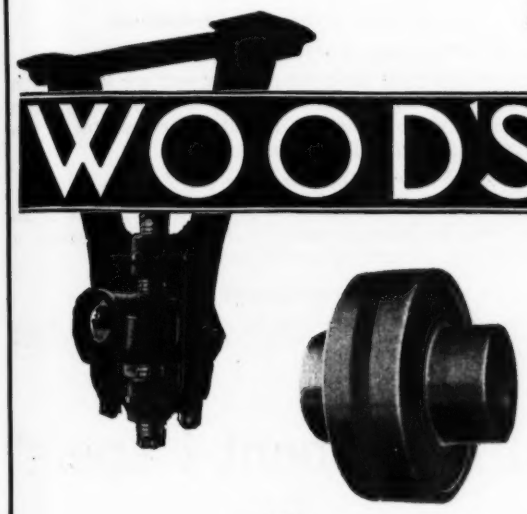
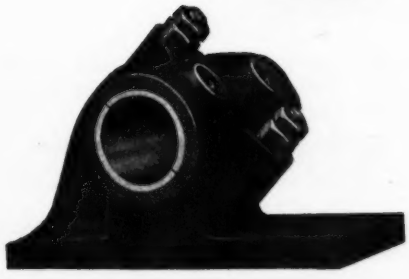


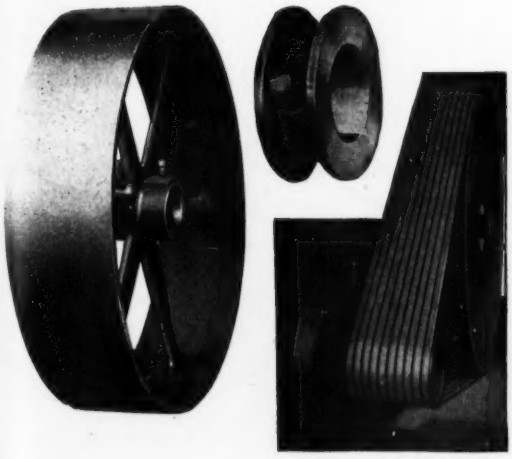

FIG. 2

# *Standardize on —*

# WOOD'S GROUP DRIVE EQUIPMENT







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temperature difference between room and outside air, and construction of roof and roof deck.

Insulation shall be made from suitable wool felts of proper thickness protected on inside and outside with asphalt impregnated felts. To prevent infiltration of moisture to pipe surface it is desirable that broken joint construction of insulation be used.

All fittings to be insulated with hair felt secured in place with jute twine. Over insulation shall be placed a double layer of asphalt saturated tape.

Chart (Fig. 1 Table VII) gives the total resistance to heat flow required to prevent condensation under varying conditions of room temperature, humidity and temperature difference between room and outside air. From Fig. 1 and Tables VII and B showing resistances of materials the thickness of insulation required to keep the under surface of the roof deck above the dew point and prevent deposition of moisture can be determined.

To obtain results, conditions must be kept constant. Base calculations on worst possible conditions. Regardless of kind of insulation used on roof deck be certain that the under-side of insulation and exposed edges are sealed to prevent moisture absorption.

### General Data Pertaining to Insulations

*Heat Loss From Bare Surfaces*

The accompanying table shows bare surface losses from heated surfaces under conditions of known temperature differences between atmosphere and heated surface. The figures given are for still air condition.

*Effect of Air Velocity On Bare Surface Losses*

So that consideration may be given to the effect of air velocity Fig. 2 showing ratio of bare surface losses to loss under still air conditions is shown.

### Acknowledgement

Your Committee wishes to acknowledge the courtesy of the Johns-Manville Sales Corporation in permitting the use of the tables and charts contained in these specifications.

# Drying Rate for Tissue and Absorbent Papers*

By A. E. Montgomery[1]

### Abstract

*The rate of drying on a paper machine is expressed either in production drying rate, which is pounds of paper per hour per square foot of drying surface, or evaporation drying rate, which is pounds of water evaporated per hour per square foot of drying surface. Drying rate is assumed to vary as a straight line function of the steam temperature within the driers. Drying rates for tissue and absorbent papers are lower than for kraft paper or news. The drying rate on Yankee driers is about four or five times as high as for other driers. The weight of the sheet has a decided effect upon the moisture content of the sheet entering the driers, most particularly on the lightest weights.*

In previous years this Subcommittee of the Heat and Power Committee has collected data by means of questionnaires on the drying rates of paperboard *(1)*, kraft paper *(2)*, and news print *(3)*. During the past year data has been collected on glassine and greaseproof papers, and writing papers, besides tissue and absorbent papers.

It is the hope of the committee that knowledge of what constitutes good, fair, and poor practice of drying rates for the different classes of paper will be useful to mill engineers and operating men in checking any particular machine to see whether it is drying as it should. We hope that with a completion of the individual studies of drying rates conclusions may be made as to the general effect on drying rates of sizing, hydration, weight of sheet, moisture content, freeness, and other factors.

It is unfortunate that the data on which our reports are based does not include more mills, which would result in greater accuracy, but we believe the data at hand warrants such general conclusions as we have drawn.

### Definition of Drying Rate

For our purposes drying rate has been defined as the pounds of paper dried or pounds of water evaporated per hour per square foot of total paper and felt drying surface covered by the width of the sheet.

### Method of Calculating Drying Rate

The total drying surface per inch of width:

(1) $$S/W = 0.0218\ (N_p\ D_p + N_f\ D_f)$$

Where $N_p$ and $D_p$ represent respectively the number and diameter of the paper driers, and $N_f$ and $D_f$ represent respectively the number and diameter of the felt driers.

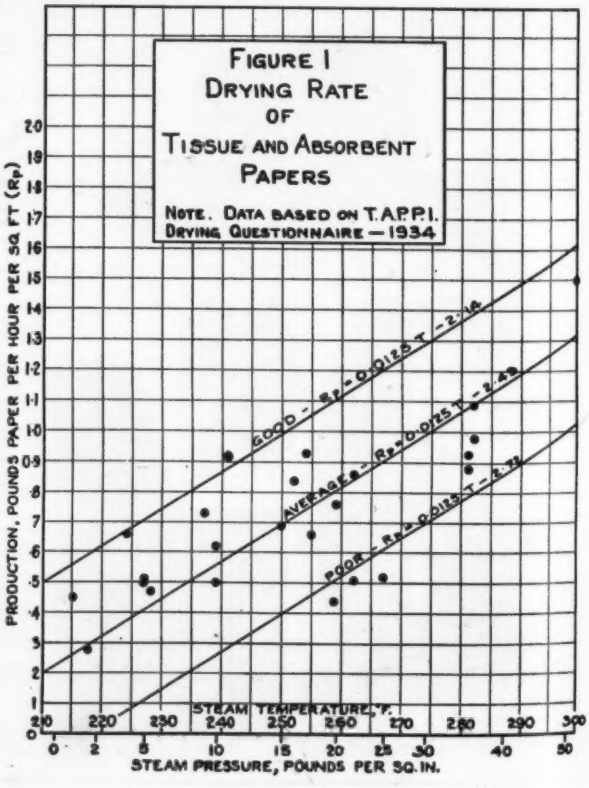


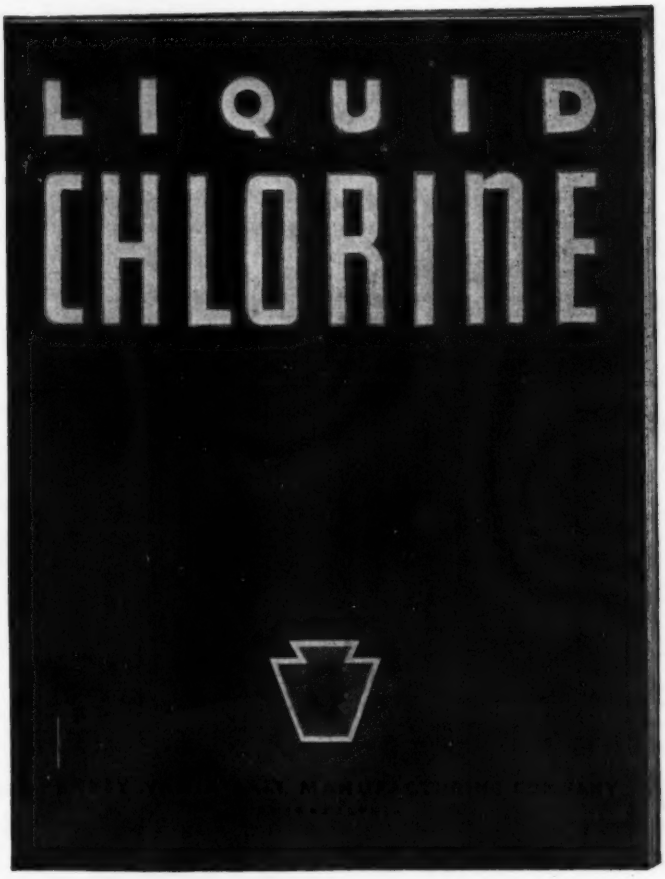
FIGURE 1
DRYING RATE
OF
TISSUE AND ABSORBENT
PAPERS
NOTE. DATA BASED ON T.A.P.P.I.
DRYING QUESTIONNAIRE — 1934
GOOD - Rp = 0.0125 T - 2.46
AVERAGE - Rp = 0.0125 T - 2.96
POOR - Rp = 0.0125 T - 3.71
PRODUCTION, POUNDS PAPER PER HOUR PER SQ. FT. (Rp)
STEAM TEMPERATURE, °F.
STEAM PRESSURE, POUNDS PER SQ. IN.

* Presented at the Annual Meeting of the Technical Association of the Pulp and Paper Industry, Waldorf-Astoria Hotel, New York, N. Y., Feb. 17 to 20, 1936

Contribution of the TAPPI Heat and Power Committee.

NOTE: This paper is based on a survey made by the Subcommittee on Drying, Heating and Ventilating.

[1] Member TAPPI, Western Manager, J. O. Ross Engineering Corporation, Chicago Office.

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The drying rate expressed in pounds of paper dried per hour per square foot of drying surface:

$$(2) \qquad R_p = \frac{\text{Speed} \times \text{Weight}}{S/W \times K}$$

Where: Speed = Speed of machine in feet per minute.
Weight = Standard ream weight of sheet.
K = A constant depending on the ream size, and which for tissue on a basis of 24x36-480 is 576; on a basis of 20x30-480 is 400; or for blotting on a basis 19x24-500 is 317.

For calculating pounds of water evporated per pound of paper dried, the writer has found the following formula most convenient and easily remembered:

$$(3) \qquad M = \text{B.D./B.D.} - 1$$

Where the B.D. above the line represents the per cent dryness of the sheet leaving the driers (the larger numeral), and the B.D. below the line the per cent dryness entering the driers.

The drying rate expressed in pounds of water evaporated per hour per square foot of drying surface then becomes:

$$(4) \qquad R_w = R_p \times M$$

### General Conclusions

Fig. 1 shows the production drying rate $R_p$ plotted against steam pressure in the driers. We have assumed here, as in the previous reports on drying rates, that the drying rate varies as a straight line function of the steam temperature corresponding to the saturation temperature at the steam pressure existing in the driers. The lines representing good and poor practice have been drawn arbitrarily, the slope being somewhat less than in the previous reports for kraft and news. The rather limited amount of data prohibits exact conclusions as to the effect of steam pressure on drying rates.

Fig. 2 shows the evaporation drying rates expressed in pounds of water evaporated per hour per square foot of drying surface. These values are a better measure of the functioning of the drier section of a paper machine than are the production drying rates because with good water removal on the fourdrinier end of the paper machine one might obtain a high production drying rate in spite of a poor evaporation drying rate.

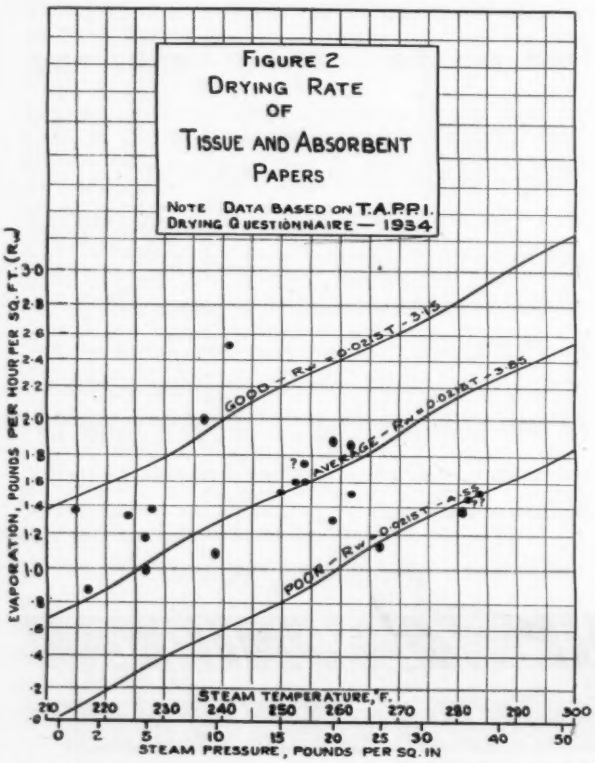


FIGURE 2
DRYING RATE
OF
TISSUE AND ABSORBENT
PAPERS
NOTE DATA BASED ON T.A.P.P.I.
DRYING QUESTIONNAIRE — 1934
EVAPORATION, POUNDS PER HOUR PER SQ. FT. (Rw)
GOOD - Rw = 0.02ST - 3.45
AVERAGE - Rw = 0.02ST - 3.85
POOR - Rw = 0.02ST - 4.25
STEAM TEMPERATURE, °F.
STEAM PRESSURE, POUNDS PER SQ. IN.

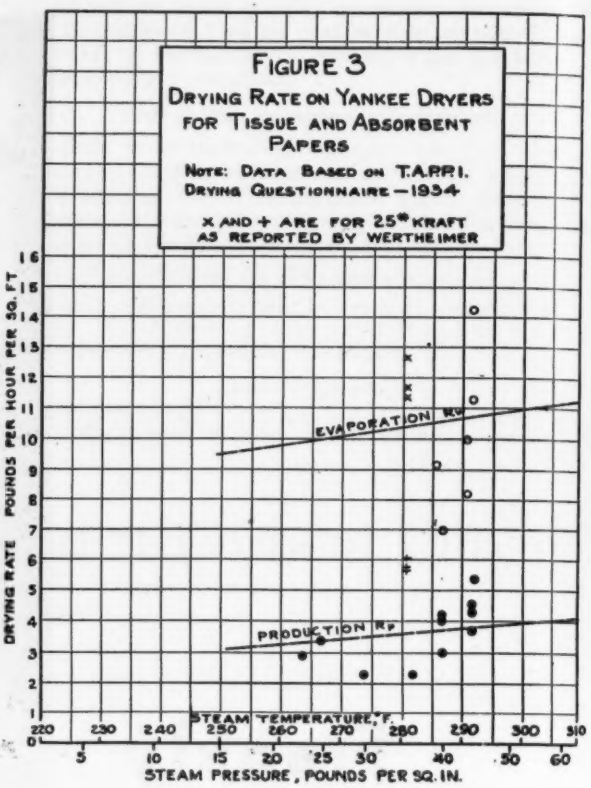
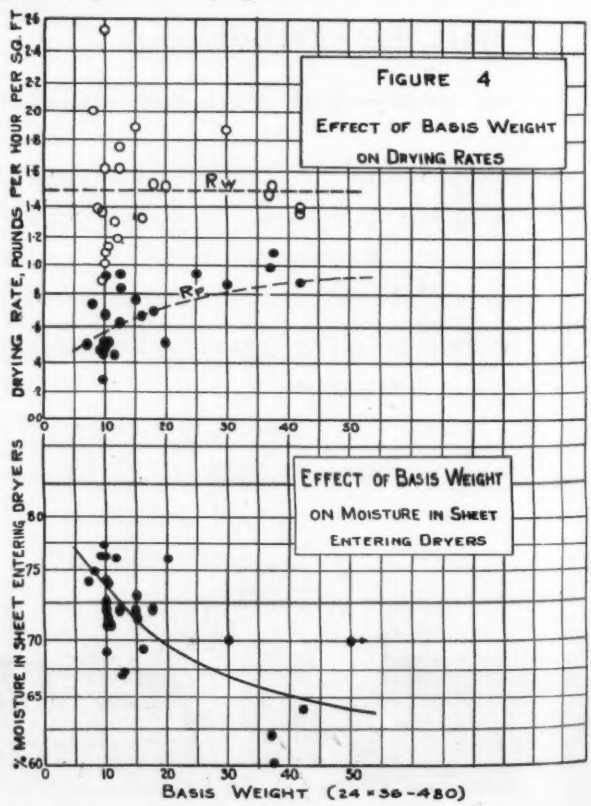


FIGURE 3
DRYING RATE ON YANKEE DRYERS
FOR TISSUE AND ABSORBENT
PAPERS
NOTE: DATA BASED ON T.A.P.P.I.
DRYING QUESTIONNAIRE — 1934
X AND + ARE FOR 25# KRAFT
AS REPORTED BY WERTHEIMER
DRYING RATE POUNDS PER HOUR PER SQ. FT
EVAPORATION Rw
PRODUCTION Rp
STEAM TEMPERATURE, °F.
STEAM PRESSURE, POUNDS PER SQ. IN.



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In collecting data on the drying rate for tissue and absorbent papers, a number of machines reported had Yankee driers used either with or without other driers. Fig. 3 shows the drying rate on the Yankee driers for which data was reported. It is unfortunate that more data was not available for inclusion. The three special values indicated on Fig. 3 for 25-pound kraft paper are as reported by R. S. Wertheimer in his excellent study of drying paper on Yankee driers. *(4)* It is not our intention to imply that the effect of steam pressure on the Yankee drying rates is as shown by the straight lines on Fig. 3. The data, however, is given here for such interest as it may have as indicating the drying rates which may be expected on Yankee driers. It will be noted that the drying rates are four or five times as high as for the multiple drier arrangement.

The weight of the sheet of paper for tissue and absorbent papers has a considerable effect on the moisture content of the sheet entering the driers, it being difficult to extract water from a very light weight sheet. The lower portion of Fig. 4 shows the moisture content of the sheet entering the driers of the various machines reported upon plotted against basis weight.

As would be expected in consequence of the larger amount of water to evaporate per pound of paper from a light weight sheet, the production drying rate for the light weight sheet is not as high as for the heavier weights. A study of the data submitted would seem to indicate that the evaporation drying rate is about the same for the different weights of paper. In the previous study of the drying rate of kraft paper *(2)*, the conclusion was reached that if a correction were made for steam pressure, the weight of the sheet of kraft paper had no effect on production, but the data there was all for sheets 25 pounds basis weight or heavier.

### Literature Cited

(1) Stamm, F. C., Paper Trade J. 94, No. 17: 42-44; T.S. 227-9 (April 28, 1932); Tech. Assoc. Papers, XV: 208-10 (1932).
(2) Montgomery, A. E., Paper Trade J. 96, No. 11: 32-35 (Mar. 16, 1933); Tech. Assoc. Papers, XVI: 172-175 (June, 1933).
(3) Adams, F. W., Paper Trade J. 98, No. 1: 38-40 (Jan. 4, 1934); Tech. Assoc. Papers, XVII: 219-212 (June, 1934).
(4) Wertheimer, R. S., Paper Trade J. 94, No. 5: 49-50 (Feb. 4, 1932); Tech. Assoc. Papers, XV: 241-242 (June, 1932).

# The Rate of Drying of Glassine and Greaseproof Paper*

By Vincent F. Waters[1]

**Abstract**

*The equations of Montgomery for drying rates of kraft paper (2) and used by Adams for drying rates of news print (1) have been extended to apply to the rate of drying of glassine and greaseproof papers. These rates are lower than those for kraft and news print. The figures show that the rates vary more widely than for classes of papers studied previously.*

During the past few years this committee has been computing and compiling data on the rate of drying of various grades of paper and board and as a result the time is near when sufficient facts will have been obtained so that executives, engineers and superintendents will have immediately available valuable data for checking drier performance and comparing one machine with another.

Mills cooperating in these reports by replying to the questionnaires should benefit particularly since they receive specially marked reports.

Several factors probably account for the very good rates of some machines over others, such as special ventilation systems, properly designed hoods, and effective drainage systems.

### Method of Calculation

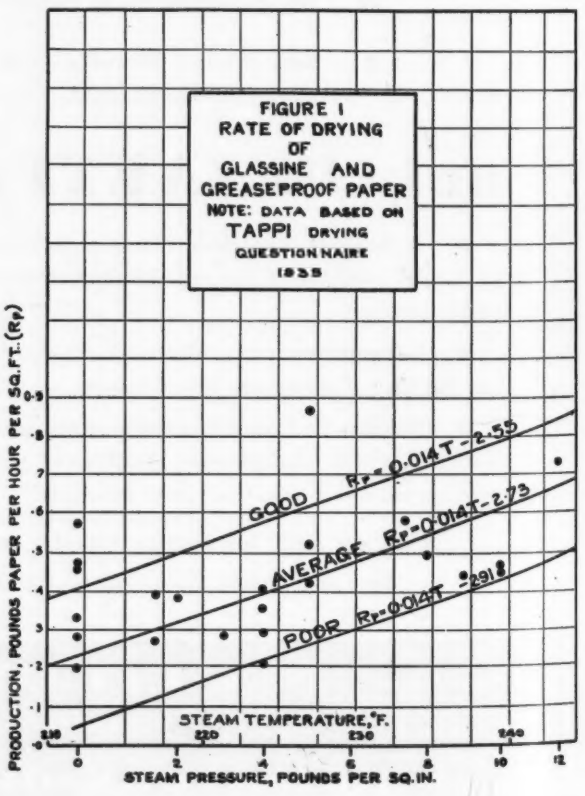
Knowing the machine speed, basis weight, and the number and diameter of the driers, the production of paper per square foot of drier surface can be calculated. Adams in his paper on news print has covered this (1), but the formulas below are for those who may not have ready access to his paper. The simple methods of calculations of "evaporation" and "production" are:

1. The total drying surface, as square feet per inch of width.

$$S/W = 0.0218\ (N_pD_p + N_fD_f)$$

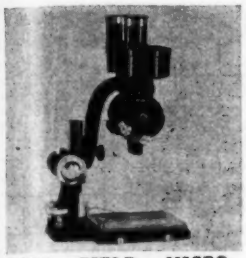
where $N_p$ and $D_p$ represent respectively the number and diameter of heated paper driers and $N_f$ and $D_f$ represent respectively the number and diameter of the felt driers, drier diameters expressed in inches.

2. The production drying weight, expressed as pounds




* Presented at the Annual Meeting of the Technical Association of the Pulp and Paper Industry, Waldorf-Astoria Hotel, New York, N. Y., Feb. 17 to 20, 1936.
Contribution of the TAPPI Heat and Power Committee.
NOTE: This paper is based on a survey made by the sub-committee on Drying, Heating and Ventilating.

[1] Member TAPPI, Plant Engineer, The Wrenn Paper Co., Middletown, Ohio.



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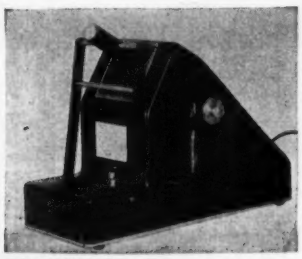

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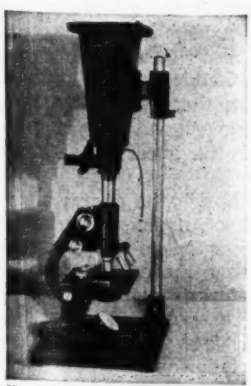

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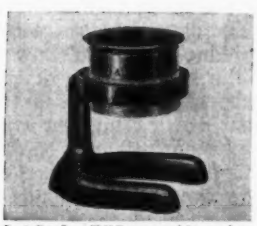

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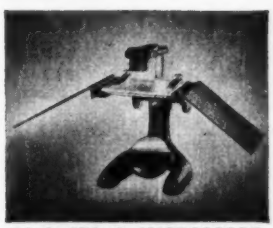

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of paper produced per hour per square foot of drier surface.

$$\text{Production} = \frac{\text{Speed} \times \text{Weight}}{s/w \times 600}$$

where: Speed = Machine speed in feet per minute
Weight = Basis weight—24 x 36-500

3. The water evaporated per pound of paper dried.

$$W = \frac{A - B}{100 - A}$$

where A = per cent moisture content of the sheet entering the driers
B = per cent moisture content of the sheet leaving the driers

4. The evaporation drying rate, expressed as pounds of water evaporated per hour per square foot of drier surface.

$$\text{Evaporation} = \text{Production} \times W$$

### Discussion of Results

Fig. 1 shows the effect of steam pressure or the corresponding steam temperature on the production drying rate. The parallel lines indicate the general effect of increased steam pressure, although the data available and plotted is not sufficient to indicate the effect accurately. The slope of the lines in general follows that of Adams (1) and Montgomery (2) but is not quite so steep. The lines have been drawn arbitrarily to represent good, average and poor practice as indicated by the data.

Fig. 2 indicates the evaporation drying rate. It is interesting to note that what we here represent as good practice represents a drying rate two to three times as good as the line representing poor practice, in spite of which the data submitted showed even greater extreme variations.

Compared with kraft paper and news print it is noticeable that the drying rates for glassine and greaseproof paper are much more variable.

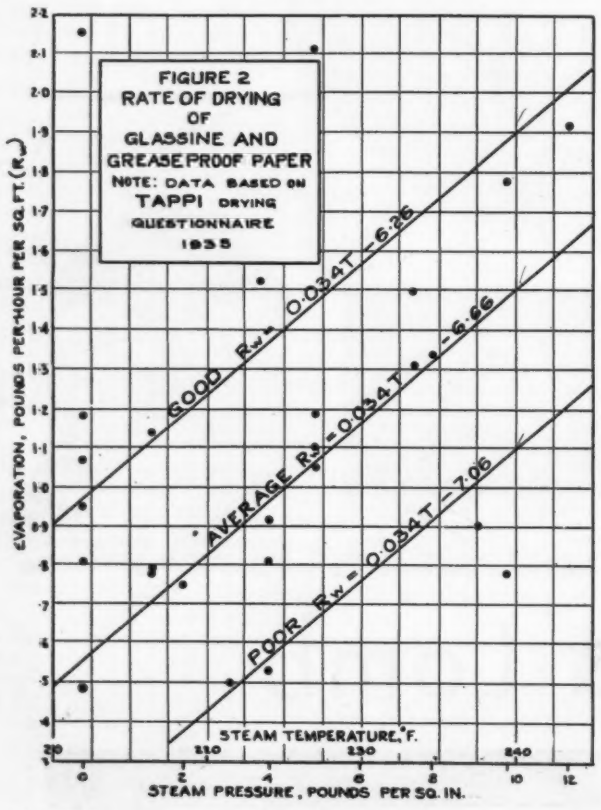
FIGURE 2
RATE OF DRYING OF GLASSINE AND GREASEPROOF PAPER
NOTE: DATA BASED ON TAPPI DRYING QUESTIONNAIRE 1935
GOOD Rw = 0.034T − 6.26
AVERAGE Rw = 0.034T − 6.66
POOR Rw = 0.034T − 7.06
EVAPORATION, POUNDS PER HOUR PER SQ. FT. (Rw)
STEAM TEMPERATURE, °F.
STEAM PRESSURE, POUNDS PER SQ. IN.

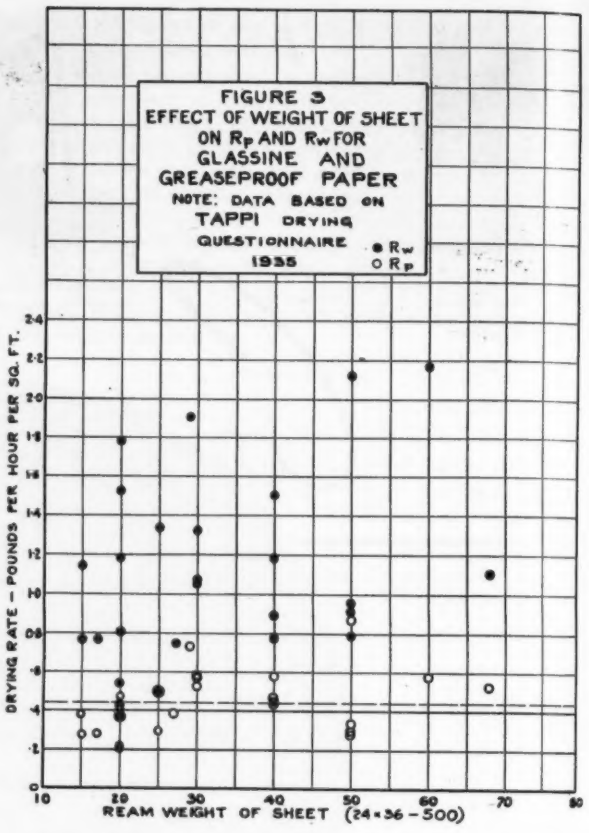
FIGURE 3
EFFECT OF WEIGHT OF SHEET ON Rp AND Rw FOR GLASSINE AND GREASEPROOF PAPER
NOTE: DATA BASED ON TAPPI DRYING QUESTIONNAIRE 1935
● Rw
○ Rp
DRYING RATE — POUNDS PER HOUR PER SQ. FT.
REAM WEIGHT OF SHEET (24×36 − 500)

Fig. 3 shows the data plotted to indicate any effect which the weight of the sheet might have on both the production and evaporation drying rates. The extreme variation in the data makes it difficult to draw a definite conclusion, but it appears that the weight of the sheet has little or no effect on the production drying rate. This is the same conclusion reached by Adams and Montgomery, although it is contrary to the views of many mill operating men. If more companies had cooperated in filling in the questionnaire sent to them there would have been enough data collected so that conclusions could have been drawn regarding the weight of the sheet based on the dryness going to the driers.

The data was also plotted, although the curves are not reproduced here, to show the effect, if any, of the weight of the sheet on the dryness going on to the driers and hence on the pounds of water evaporated per pound of paper dried. The data would not warrant the drawing of conclusions. It may be of interest, however, to the operating men that the average of all data submitted indicated approximately 2.4 pounds of water evaporated per pound of paper dried.

This corresponds to about 27.7 per cent bone dry or 72.3 per cent moisture going into the driers.

The machines represented in this report had clean driers in every case except one, and this one reported driers in fair condition.

Some mills reported that their stock went into the drying section at 12 deg. F. Some were equipped with special drying control features.

### Literature Cited

(1) Adams, F. W., Paper Trade J. 98, No. 1: 38-40 (Jan. 4, 1934); Tech. Assoc. Papers, XVII: 210-212 (1934).
(2) Montgomery, A. E., Paper Trade J. 96, No. 11: 32-5 (Mar. 16, 1933); Tech. Assoc. Papers, XVI: 172-6 (1933).

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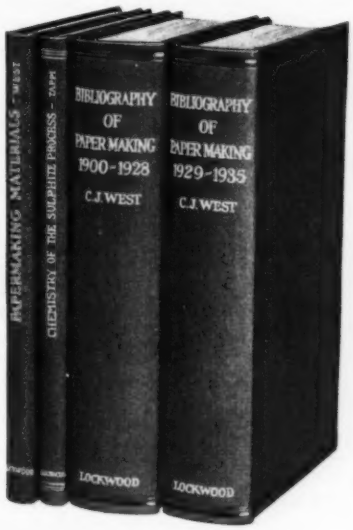
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# FOR PAPER MEN

# Mechanical Design of Electrical Machinery*

By C. J. Koch[1]

A paper on this subject would be long if all types of electrical apparatus were included. This paper, therefore, will be limited to certain features of mechanical design which are common only to rotating apparatus, as induction and synchronous motors, generators, direct current motors.

Mechanical design work seems to naturally divide itself into two divisions. There is the work of actually proportioning parts so that they are strong enough, their periods of vibration proper, etc. Secondly, there is the work of designing the arrangement of these parts or devising new arrangements. The first of these requires certain formal text book knowledge. Where the limits of the service are accurately predictable the design may be drawn close to these limits. Where the limits are not so well defined, as for a general purpose motor, which may be connected to its load in one of several ways, parts must be proportioned sufficiently strong to cope with the most severe condition.

There have been great advances in recent years in this first division of mechanical design. For example, the application of welding has enabled stronger, shock proof, mechanical structures to be built, with much greater flexibility for construction and repair. The development of modern electrical brazing methods has greatly improved the reliability of electrical joints under high stress and high temperature conditions. Also, the refinements of modern measurement methods have enabled improved mechanical balance and greater quietness to be incorporated in all designs. In fact, the developments in both theory and in manufacturing methods have raised the level of mechanical design to such a point that electrical apparatus very rarely fails due to operation under the conditions anticipated by the designer.

Thus, designers of electrical machinery are mechanical even more than electrical engineers. In fact, the great variety of mechanical problems involved in decisions concerning lubrication, ventilation, shaft deflections, clearances, high strength steels, and manufacturing methods, is making the mechanical engineering part of the designer's work of relatively greater importance as time goes on. The recent trend to full voltage motor starting, for example, has required careful mechanical designs of coil bracing, slot wedges, motor frames, feet, and shafts to be sure they will all withstand the repeated short circuit forces to which they are now subjected.

There is one characteristic difference, however, between the electrical and mechanical design problems. Most electrical equations and characteristic constants hold with fair uniformity over a wide range of machines, or vary only slowly with changes in machine rating. Mechanical characteristics, however, such as the ratio of the ultimate strength of a shaft to full load torque, vary very widely from one type or application of machine to another, and may be totally different for machines of the same electrical rating, due to different application requirements.

Aided by the development of new materials and better knowledge, the designers are continually reducing the amount of material required to obtain a given power output. These reductions in weight and space required, however, have not impaired machine characteristics. At no time in the history of the art have better efficiencies, more sturdy constructions, or more flexible yet balanced performance characteristics been obtainable. The progress has been made by utilizing materials more effectively, by designing to meet specifications more exactly, and by obtaining a much better balance between the numerous factors involved in design. Future progress will be more and more dependent upon designing electrical machines to fit the specific industrial purposes which they are intended to serve.

The other division of the work dealing with the actual arrangement of the parts of the apparatus, is of course the starting point in the design and is the one with which we are principally concerned here. The design must be drawn to meet the requirements of the service and be such as can be manufactured profitably. Here the element of experience is needed. Conditions vary greatly from industry to industry.

This paper will deal with the arrangement of those mechanical parts of rotating electrical machinery such as systems of ventilation and enclosure, fans, bearings, etc., which are most important from an operating point of view and where the experience gained in service is or should be the deciding factor in their design. In other words I want to talk about those features of design with which we designers need the help of those in your industry who are responsible for the operation and maintenance of our electrical machines. The various types of apparatus to be described have been developed to meet the requirements of different conditions, many of these to be found in the pulp and paper industry.

The design of the ventilating system and the enclosing features go hand in hand and furnish a good starting point.

### Ventilation and Enclosure

With few exceptions electrical apparatus is cooled by circulating air. That sufficient air is circulated and in the proper places is just as important as for the machine to have the proper torque, power factor, etc. Furthermore the power required to circulate this air may be appreciable

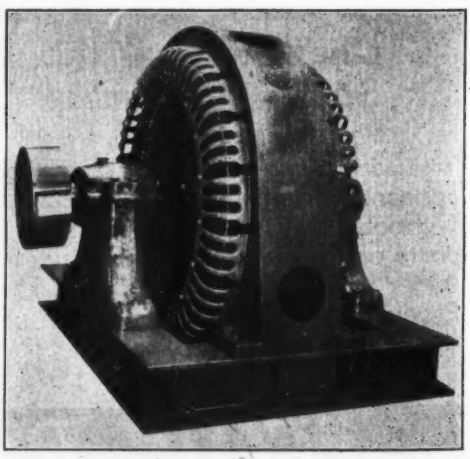
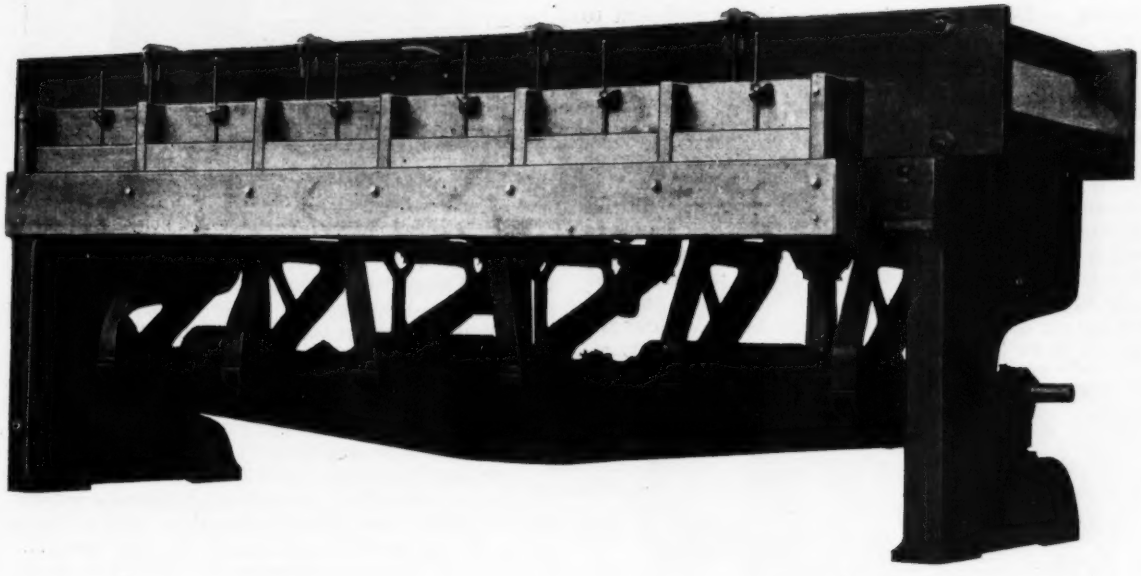


FIG. 1
Synchronous motor of open, pedestal bearing design.

* Presented at the Annual Meeting of the Technical Association of the Pulp and Paper Industry, Waldorf-Astoria Hotel, New York, N. Y., Feb. 17 to 20, 1936.

[1] Induction Motor Department, General Electric Company, Schenectady, N. Y.

# Waterous Flat Screen



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and must be kept to a minimum to insure high efficiency. At the same time some degree of enclosure of the machine may be necessary as for example to exclude dirt or dripping water. Here then, enclosure and ventilation must be worked out together. To show how this may be done several examples follow.

OPEN CONSTRUCTION: FIG. 1 shows a synchronous motor of the simplest form from the point of view of ventilation and enclosure. Enclosure is only sufficient to prevent contact with live parts, whereas, ventilation is simply that furnished by the revolution of the poles. In the construction of induction motors a portion of the air is circulated over the coil ends by fans on the ends of the rotor. The remainder is drawn into the rotor and discharged axially through ducts in the rotor which line up with similar ducts in the stator.

SPLASH PROOF CONSTRUCTION: Many motors with this appellation have appeared on the market. Fig. 2 shows an induction motor of this type in which covers are added making the motor proof against splashing water. In all designs of this type a balance must be struck between letting the air in and keeping the liquid out. Various designs lean more heavily one way or the other in this respect but in general a sacrifice in either horsepower rating or temperature rise must be made to accomplish this balance.

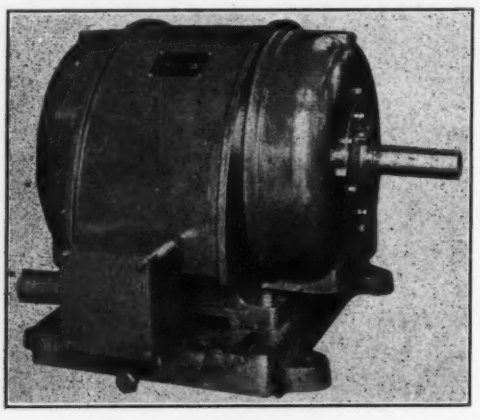

FIG. 2
Induction motor of splash proof design.

It should be kept in mind that this design does not profess to keep out moisture, dirt or chemicals carried in the air. Hence these may condense or lodge and accumulate in the motor. The design which gives the most constricted and intricate air path may be the worst offender in this respect. The particular design in Fig. 2 is worked out with the idea of having an ample enclosure and at the same time having the covers removable for cleaning. They may be left off entirely if it is desired to convert the motor to open construction for other locations and enjoy a somewhat lower temperature guarantee.

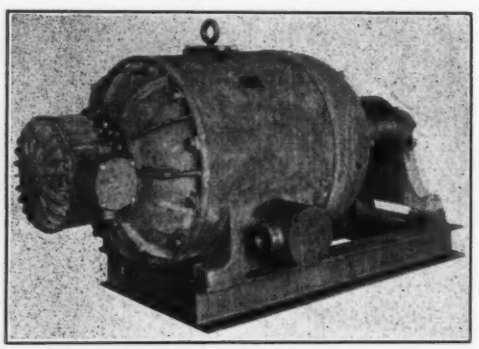

FIG. 3
Totally enclosed fan cooled synchronous motor.

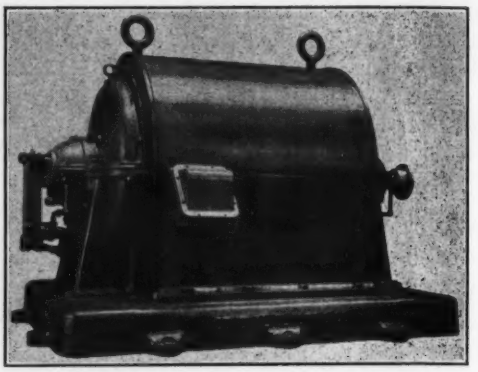

FIG. 4
1400 hp., 3600 r.p.m. induction motor arranged for air intake and discharge through base.

Conduit boxes of "weatherproof" construction have become standard on machines of this type.

TOTALLY ENCLOSED CONSTRUCTION: The antithesis of the open construction is the totally enclosed machine. Here the enclosure is complete but cooling is only by the natural radiation and conduction from the external surface. This construction is very common in fractional horsepower motors. Since the volume and hence the torque producing power of a motor varies as the cube of any dimension and the external surface only as the square the normal external surface is ample for cooling only in small motors. Hence this construction is usually limited in size unless means are taken to artificially increase the heat pick-up from the surface.

TOTALLY ENCLOSED FAN COOLED CONSTRUCTION: This is accomplished in the totally enclosed fan cooled machine by providing an external fan which delivers air through axial passages arranged around the periphery. The windings and interior of the motor are just as much enclosed as in the case of the totally enclosed motor, and the horsepower output is greatly increased.

The totally enclosed fan cooled machine suffers from the same discrepancy between surface and volume as the totally enclosed machine with the difference that whereas in the totally enclosed construction the cost becomes prohibitive at a few horsepower, when the fan is added the

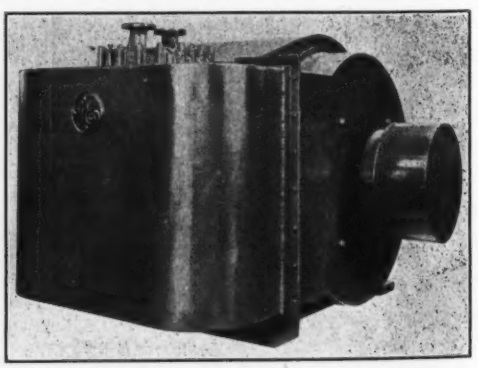

FIG. 5
Slip ring induction motor arranged for closed circuit ventilation with surface air cooler.

limit is raised to several hundred horsepower. At present induction motors of this construction are available at 1800 r.p.m. and 3600 r.p.m. rated as high as 300 hp. and with improvement following study of losses and ventilation the available size is gradually being pushed up. Fig. 3 illustrates a synchronous motor built in the totally enclosed fan cooled construction. The rotor winding collector rings are housed in the box on the end of the motor. This has necessitated bringing out the shaft extension for the pulley through the ventilating fan. As this increases the overhang of the pulley from the motor bearing it was necessary to add an outboard bearing to prevent overloading the motor bearing.

By removing the cover surrounding the fan the air passages around the frame may be readily cleaned if necessary.

Closed Circuit Ventilation: As stated the totally enclosed fan cooled machine becomes very expensive in large sizes. This requires the development of other systems of ventilation for large units where the atmospheric conditions are such as to require a high degree of enclosure. As an example even with normal conditions in very large turbine generators the tremendous quantities of air circulated would result in the deposition in the machine of a large amount of dirt due only to a fairly moderate dust concentration in the air. Hence an enclosed system is required using the same clean air over and over. Such a system may be referred to as closed circuit ventilation.

This air must however be cooled after passage through the machine. Where water is available the surface air cooler is used for this purpose. These coolers are often built into the foundations of the machine or into a housing surrounding the machine. Fig. 4 is a motor arranged to take in and discharge air through the base and would be well suited to closed circuit ventilation. Fig. 5 is a 500 hp. slip ring induction motor built for a unit of the pulp and paper industry and using closed circuit ventilation. Here the surface air cooler is an integral part of the motor.

Pipe Ventilation: Frequently the air immediately surrounding a machine may be filled with injurious dirt or chemicals whereas a short distance away pure air is available. Machines arranged for pipe ventilation may be used under such circumstances. Such machines are totally enclosed except that openings are provided for the entrance and discharge of air to which pipe can be attached. Motors of this type gave indications of becoming very popular at one time but were largely abandoned when the more convenient totally enclosed fan cooled motor was developed.

When the pipes are very long a separate blower may be required to overcome the loss of head in the pipes. At times it is desirable to have a separate blower even when the pipes are short. Such a case would be when a slip ring motor is required to operate at low speeds for long periods but at sustained torque. Fig. 6 shows an interesting motor of this type. In the design of this motor large anti-friction bearings were required to carry a very heavy gear load. In addition an elaborate oiling system was required to permit tilting the motor 45 degrees in a vertical plane through the shaft.

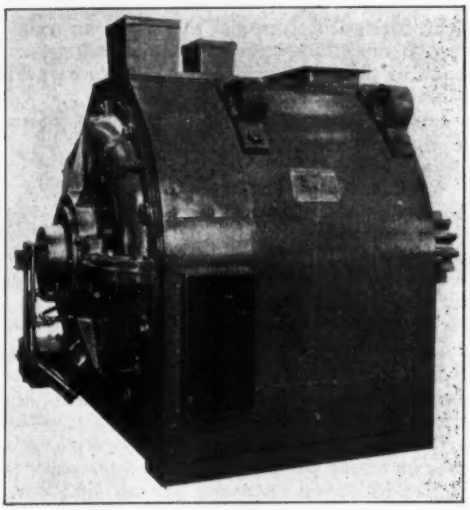

Fig. 6
Slip ring induction motor arranged for ventilation by separate blower.

Other Systems: Other methods of obtaining cooling yet with enclosure have been used but not frequently. As an example machines have been built with jackets surrounding them through which water or other liquids can be circulated.

### Fans

Many machines use for ventilation a simple form of centrifugal fan having radial blades fastened to each end of the rotor. Because the static pressure required to force the air through the machine is low only the simplest shrouding of the fan is necessary. A very satisfactory form of this fan is shown in Fig. 7. This rotor is from a squirrel cage induction motor and the fans are cast integral with the end ring and bars. This sturdy construction is very desirable as these fans are subject to vibrations of many frequencies especially in the case of gear driven equipment. Fans fabricated of light sheet metal and improperly braced against these vibrations have been frequently known to suffer fatigue failures and break off due to resonances developing with the impressed vibrations.

As machines increase in size and speed greater quantities of ventilating air are required and the static pressure required is higher. The design of the fan then becomes a more scientific problem. The blades are slanted and the shape accurately worked out. A shroud with a labyrinth seal to prevent leakage is added. At times a diffuser around the discharge of the fan may be added to convert as much as possible of the velocity head at leaving to static head. A centrifugal fan of this more refined type as used on the rotor of a turbine generator is shown in Fig. 8.

In high speed machines of this type the air is fed in an axial direction into the air gap and a portion of the stator

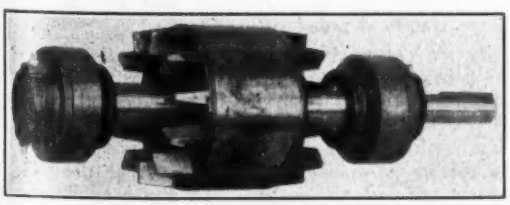

Fig. 7
Induction motor rotor of cast aluminum squirrel cage design.

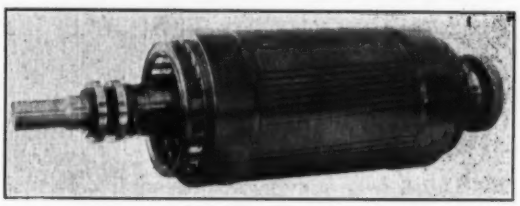

Fig. 8
Turbine generator rotor with centrifugal fans.

slots. A fan designed to propel the air in an axial rather than a radial direction therefore has advantages. Fig. 9 shows a fan of this type applied to the rotor of a 1400 hp., 3600 r.p.m. squirrel cage induction motor.

High speed totally enclosed fan cooled motors also make use of external fans of this type.

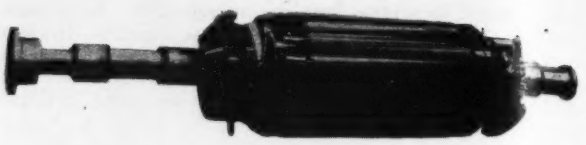

FIG. 9
Axial or propellor type fan used on 3600 r.p.m. induction motor rotor.

### Bearings—Sleeve Type

The sleeve or journal type bearing is widely used in rotating electrical machines. Although it appears in many different forms the essentials are always the same. The differences in detail are the result of different means of removing the heat developed in the bearing. In proper operation there is no metallic contact between the shaft and the bearing surface. A thin intervening film of oil provides the separation and makes possible the operation of the bearing. Under the shearing action of these surfaces heat is generated in the oil film. This will increase moderately with increased load on the bearing and much faster with increased peripheral speed of the shaft journal. In effect the following examples are all simply different ways of carrying away this heat.

WASTE OR WICK FED BEARING: In this type of construction there is no circulation of the lubricant or at best it is very slow. Oil is fed to the shaft by contact with a wick dipping in oil. As all heat dissipation is by conduction through the shaft or the housing which supports the bearing lining it is limited to small loads or low peripheral speeds. It is very common in factional horsepower motors.

RING LUBRICATED BEARING: Where due to speed or load it is necessary to dissipate more heat than a wick fed bearing can handle the simple ring lubricated bearing may be used. Fig. 10a shows in sectional view a bearing of this type. Here considerable heat is carried away by the bath of oil provided by the ring.

This oil settles into the reservoir at the bottom of the housing. Here it is cooled by contact with the walls of the housing. The cooling of the housing itself is greatly facilitated if the ingoing ventilating air to the machine can be made to flow over it.

Many bearing materials are available from which the sleeve itself may be made. In this sectional view the bearing is a steel tube in which tin babbitt has been centrifugally cast. The steel tube gives high strength and the babbitt provides a good bearing surface.

The design of the housing itself involves many considerations. A sump should be provided for particles of metal, sludge and foreign matter to settle into. Tight covers are necessary over all openings to exclude dirt. Usually two openings besides the shaft holes are provided. These are the sight hole through which the operation of the ring is inspected and the oil filler gauge which establishes the oil level. It is also convenient to have a drain plug when the oil is changed or when it is drained preparatory to moving the machine. Very nearly horizontal alignment of the shaft must be maintained with this construction to prevent oil leakage along the shaft.

Fig. 10b shows a design for slightly higher speed and diameter. Here the bearing is split to facilitate renewal. In addition a cored passage is added which furnishes air at atmospheric pressure in the annular space around the shaft and prevents the ventilating fans from sucking oil from the housing.

In order to prevent leakage of oil along the shaft it is essential to keep the foamy oil leaving the ends of the bearing away from these points. This is accomplished by having this oil drain to the center compartment of the housing. Foaming in the oil filler gauge is minimized by having this enter an end compartment of the housing.

WATER COOLED BEARINGS: When due to peripheral speed or loading the loss in the bearing is so high it cannot be dissipated by these simple housing constructions, additional means of cooling must be used. Many means are apparent. For example, water cooling coils may be imbedded in the surface of the bearing. This construction has the advantage that it takes out the heat at the point of its generation. It is most widely used for large shaft diameters and moderate rotative speeds for which condition it is admirably suited.

PRESSURE LUBRICATED BEARINGS: For high rotative speed bearings there is little room for cooling coils in the bearing proper and here a pressure oil circulating system is used. The oil is cooled externally. For this purpose water cooling coils are placed somewhere in the system. From a reservoir oil is pumped into the bearing. The actual mechanism of introducing the oil into the bearing is shown schematically in Fig. 10c. It enters at the center line passes over the top of the shaft and leaves at the opposite center line. Only the top half of the bearing is grooved. Of course a certain amount of end leakage from the bearing occurs. This oil falls into the housing and is separately drained off.

The figure referred to shows the general arrangement of such a bearing but of course individual preference will dictate modifications. In this particular design a spherical seat is provided in the housing permitting the bearing to align itself when the unit is assembled.

In a system of this kind means must be provided for circulating oil under pressure. In the case of a turbo generator the pressure oil system of the turbine may be utilized. In other cases the pump may be mounted di-

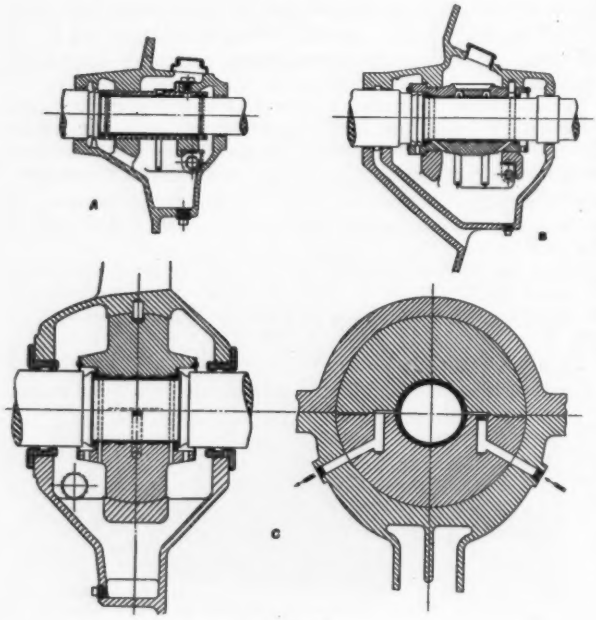


FIG. 10
Types of sleeve bearings.

rectly on the unit as in the case of the motor in Fig. 4. Here the pump shaft is vertical, driven from a worm on the motor shaft.

When an end of the shaft is not available for driving a pump, one driven by a separate motor may be used. Fig. 11 shows a 600 hp., 3600 r.p.m. slip ring induction motor so arranged. Here the collector rings occupy the end of the shaft usually available for the pump. For reliability, two separately driven pumps were used. Both pumps run all of the time. In case of failure of one unit check valves and cocks make it possible to remove it for repairs. The pressure switch on the side of the motor is interlocked with the starting switch so that the motor may not be started until oil under pressure is at the bearings. Such an arrangement is thoroughly reliable and not costly as the oil pumps themselves are relatively inexpensive.

In operation a bearing rises in temperature above its surroundings sufficiently to carry away heat at the same rate at which it is generated. The question of what maximum temperature may be allowed in a babbitt sleeve bearing is often raised. In our induction motor work we have recently made some simple experiments to get at least an approximate answer to this question. The limiting temperature is that at which the properties of the oil film are so modified that under the impressed load metallic rubbing begins. This temperature must therefore be lower for high unit pressures than for low pressures. The experimental results bear this out. For a pressure of 100 pounds per square inch of projected area successful operation was obtained with the temperature as high as 105 deg. C. At 50 pounds per square inch wiping had not yet begun at 150 deg. C. These tests were carried out on a 3 inch journal operating at 3600 r.p.m. For this type of motor service where the unit loading is rather low these results indicate entirely satisfactory operation may be obtained at these rather high temperatures.

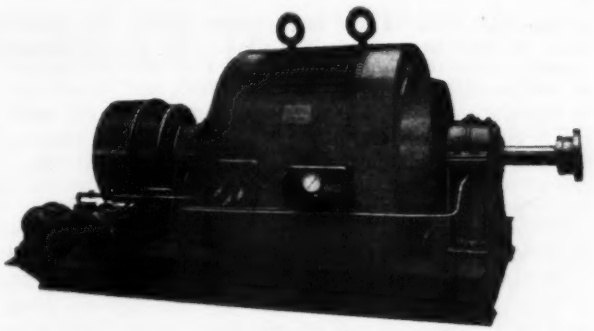

FIG. 11
600 hp., 3600 r.p.m. slip ring induction motor with separately driven oil pumps.

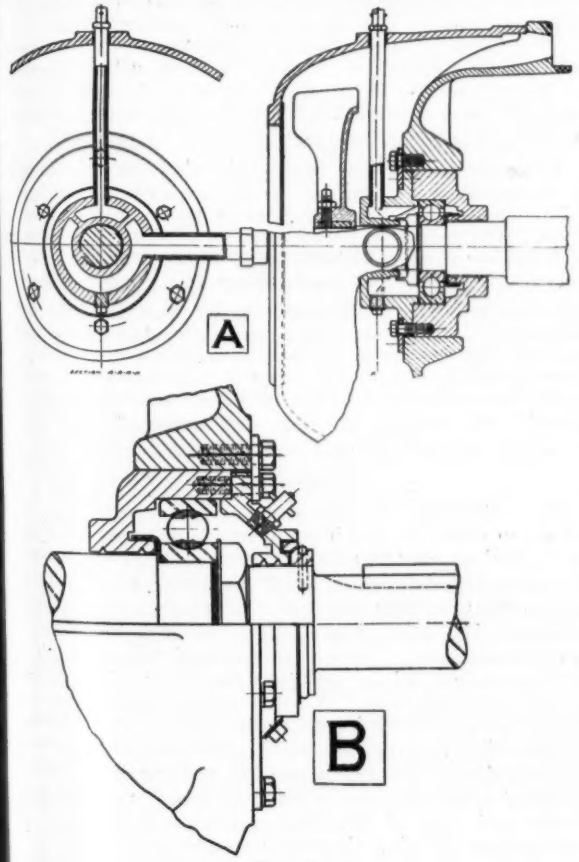


FIG. 12
Mountings of ball bearings.

### Bearings—Anti-Friction Type

Bearings of the so-called anti-friction type are built in various forms the selection for a particular installation depending upon the conditions to be met. As the life of this type of bearing is very materially affected by the load imposed upon it a proper choice depends upon a knowledge of these conditions. The most important considerations are the radial and thrust loads imposed and whether the load is steady or of a shock nature. Furthermore it is important to correlate the size of the bearings, the speed of rotation and the system of lubrication with successful operating experience.

The refinement in the manufacture of the anti-friction bearing has greatly increased its reliability and brought about its increased use in electrical machinery. It possesses certain advantages not possessed by the sleeve bearing. For example, it takes up less room. Without undue trouble thrust as well as radial load may be carried. The unit in which it is used may be moved or may operate in any position without undue loss of lubricant. This makes it advantageous in portable machinery. The static friction is low. For these reasons a considerable demand appears for it even for service for which the sleeve bearing is entirely satisfactory and less expensive. There is much room here for individual opinion and preference.

The mechanical design problems involved in the use of anti-friction bearings center around the choice of the type to be used and secondly upon the design of the housing. Of the latter the cartridge type an example of which is shown in Fig. 7 is practically standard. The cartridge remains intact when the machine is disassembled. The bearing is thus never exposed to dirt a small amount of which is fatal to the operation of anti-friction bearings.

The function of the housing is to retain the lubricant and provide means for preventing its escape along the shaft. Grease is by far the most widely used lubricant. It may be added by any of the various devices developed for automotive use or by a simple grease cup. In Fig. 12b grease is admitted to one side of the bearing through the pressure fitting shown. Where the bearing has greater axial length as in the case of a double row bearing it is better practice to force it into both sides at the same time. For this purpose a suitable channel in the cartridge is usually provided. If the bearing is built with a radial hole through the outer race this hole furnishes a convenient and effective entrance for grease.

A discussion of housings would not be complete without mention of the importance of accurate machine work. The fit of the outer race in the housing and of the inner race

on the shaft must be held to very close limits. The housing must further fit within close limits into the supporting member of the machine. If it is too tight the bearing may be subjected to undue loads in assembly and disassembly of the machine. If it is too loose it may peen out under shock loads. The tolerances to be used are the result of the bearing manufacturers' recommendations plus the result of a great deal of practical experience in the use of this type of bearing.

METHOD OF GREASING: A discussion of the method of greasing anti-friction bearings may seem more appropriate for a paper on the maintenance of electrical machines than on their mechanical design. Naturally however the design must be arranged so that maintenance can be carried out conveniently and successfully. The question of greasing is of some interest as there is unfortunately no definite indication as to when the housing contains an insufficient or an over-supply when grease is used as the lubricant. The careful operator wants to be sure there is always enough and by too frequent greasing leakage from the housing into the machine windings and over heating of the bearing take place. If insufficient grease is added the bearing life is shortened. It is therefore desirable to formulate a procedure which insures having the proper amount of grease in the housing.

For this purpose the housing shown in Fig. 12 is provided with a relief plug opposite the pressure fitting. When adding grease this plug should be removed and old grease around the orifice scraped away. New grease may then be added until it appears at this opening. The machine should then be run with the plug still removed in which case grease forced between the balls will be thrown out and a worm of grease will work out of the relief hole. When this has practically ceased the plug may be replaced and a proper amount of grease will be in the housing. Following this procedure one should err on the side of greasing more often than absolutely necessary as the bearing can not be overgreased and the addition of fresh grease purges out the old and reduces the necessity of cleaning out the entire housing with solvent.

When the bearing is in an inaccessible location such as in the fan end of a fan cooled motor it is inconvenient to remove the relief plug. In this case the design shown in Fig. 12 has been devised. Here a pipe of fairly large diameter is screwed into the housing and provides a space into which excess grease may work. As grease is pumped into the bearing its temperature will rise, the grease becomes more fluid and works into the pipe and the equilibrium is restored. Grease may be pumped into the bearing as often as desired. It is only necessary to unscrew the relief pipe and clean it out from time to time.

OTHER TYPES: So many types of anti-friction bearings have been devised that a complete résumé of them would be impossible. Among other applications they find a wide use in vertical motors where they are called upon to carry heavy axial loads. In this field alone many very ingenious methods of mounting and lubrication have been devised using oil as a lubricant.

In spite of the increased use they have found in both general and special purpose apparatus anti-friction bearings seem slow however to invade certain fields. For example in the case of large high speed machines they offer few advantages and cannot at present cope with the reliability of the pressure or ring lubricated journal bearing.

FIG. 13
Method of supporting ends of stator coils in a.c. machine.

### Winding Supports

This paper would not be complete without a brief mention of the methods of winding support. In the rotor the coils are held in the slots against centrifugal force by wedges notched into the sides of the slots or by the shape of the slots themselves. The coil ends must be supported by hoops made up of turns of wire or solid bands of non-magnetic steel as in the case of turbine generators or large high speed induction motors.

The supporting of the stator coil ends is an old problem in the turbine generator field as the large electro-mechanical forces developed during short circuit were early recognized. The extension of the practice of using full voltage starting has made necessary these same methods of support for induction and synchronous motor coils. Fig. 13 shows an induction motor stator in the process of winding. The stator coils are securely bound to insulated rings supported from the stator frame. In addition the coil sides are blocked apart and then securely tied together to withstand the distorting forces between phases. As much as possible all blocking is done with material free from shrinkage under heating.

### Conclusion

The calculation of the electrical performance of an induction motor or synchronous motor or generator could be worked out to fair approximation by a set of formulas covering, say roughly, a dozen sheets of paper. These same formulas would apply for all machines irrespective of size. The mechanical design cannot however be so readily condensed. Here each size and type of machine presents a multitude of problems peculiar to that particular size and type alone. A paper purporting to cover this subject would be filled with many details. In this paper it has only been possible to cover certain arrangements which find some common ground in most types of rotating electrical machines. It is well, however, that the purchaser and user of electrical apparatus should have an appreciation of what these arrangements, or really tools are. When special requirements arise this may facilitate the working out of a satisfactory design to meet them.

# Bursting Strength of Paper*

### Apparatus

The instruments used shall have:

1. Means for firmly clamping the specimen without slippage during the test between two annular plane surfaces (which have fine concentric tool marks for the purpose not over 0.002 inch deep). One of these surfaces, the clamping ring, shall have a circular aperture with a diameter of 1.200 (±0.001 inch) inch with a 0.025 inch radius at its clamping edge so that the edge diameter is 1.250 inches, (±0.001 inch). The other, the clamping surface, to have a circular aperture of 1.250 (or a little more) inches, with rounded lower edge in contact with the rubber diaphragm. The apertures in both surfaces shall be coaxial.
2. A rubber diaphragm clamped between the underside of the clamping surface and the rest of the apparatus such that before the rubber is stretched by pressure beneath it, the center of the upper surface of the diaphragm is in the same plane as that of the clamping surface. The thickness and quality of the rubber shall be such that when clamped in the instrument and bulged to a height of ⅛ inch above the plane on which the paper is clamped, the necessary pressure to accomplish this shall be between 1.0 and 1.25 pounds per square inch.
3. Means of applying a uniformly increasing fluid pressure to the underside of the diaphragm until the specimen is burst.
4. Means of measuring the pressure beneath the diaphragm when the specimen bursts, with an accuracy of 2 per cent.

### Calibration

The gage shall be calibrated while inclined at the same angle at which it is to be used, against a dead-weight gage tester of the piston type, or against a column of mercury. A standard pressure of the requisite degree shall be built up in 2.0 seconds plus or minus 1/5 second, or, if the pressure is over 60 pounds per square inch, the pressure shall be built up in a number of seconds numerically equivalent to a thirtieth part of the pressure in pounds per square inch plus or minus 1/5 second. For example, a pressure of 90 pounds per square inch shall be obtained in 3.0 seconds plus or minus 0.2 second. If the piston type of gage tester is used the weighted plunger shall be slowly rotated while the valve connecting the pressure to the gage is slowly opened at such a rate that the gage pointer comes to rest in the time specified.

The gage shall have been calibrated not more than one month prior to the test.

### Test Specimen

The sample for the test shall be the equivalent of ten sheets or more, each at least 2½ inches by 2½ inches in size and shall have been sampled and conditioned according to the official methods.

### Procedure

The test shall be made in atmosphere conditioned according to the official method. The specimen shall be securely clamped in position and a uniformly increasing fluid pressure applied to the underside of the rubber diaphragm such that the specimen will be burst in 2.0 seconds plus or minus 1/5 second; or if the bursting pressure is over 60 pounds per square inch, one thirtieth part in seconds of the average bursting pressure for the paper in pounds per square inch plus or minus 1/5 second. For specimens bursting at less than 10 pounds per square inch, care shall be taken to note the pressure at which the needle hesitates as the paper is burst. This reading, and not the ultimate pressure reached by the needle, shall be recorded as the bursting pressure.

At least 10 individual tests shall be made, an equal number on each side of the paper. If the mean value of the lowest and the highest reading differs from the average of all the readings by more than 5 per cent, more bursts shall be made till there is agreement within these limits. Accordingly, with an irregular sheet of paper, it may be necessary to conduct a very much larger number of tests than ten, which is the minimum number for the most uniform paper. An isolated very high or low burst, which is now repeated in duplicate, should be discarded when a consistent average is obtained without the abnormal reading.

### Report

The result shall be reported as the average bursting pressure in pounds per square inch.

### Reproducibility of Results

Duplicate results on different sets of samples from the same shipment and on different testing instruments made according to this method are expected to agree to within 5 per cent.

### Additional Information

The bursting factor is the ratio of the standard bursting strength in grams per square centimeter and the basis weight of the paper in grams per square meter.

It is calculated as follows:

$$\text{Burst Factor} = \frac{\text{Bursting pressure in pounds per square inch} \times 70}{\text{Basis weight in grams per M}^2}$$

which is equivalent to:

$$\frac{\text{Bursting pressure in pounds per square inch} \times 100}{\text{Basis weight (pounds 25} \times 40\text{"}\text{—}500) \times 2}$$

The test described is for precision work and may be carried out with a hand driven Mullen tester by turning the hand wheel progressively slower, or very simply with the Schopper Dalen air driven bursting instrument. The Mullen tester used normally, as later described, is suitable for control testing, provided care is taken of the calibration of the gage and the condition of the diaphragm, but is not capable of being accurately standardized unless for a particular quality of paper of which samples have been tested according to the above procedure.

It is suggested that for other than routine purposes

TABLE I

| | Mullen Tests | | | Standard test Precision |
|---|---|---|---|---|
| | 40-pound gage | 150-pound gage | 6 in precision | 150-pound gage |
| 50 per cent rag M. F. book | 9.8 | 8.4 | 6.5 | 8.8 |
| News | ... | 8.2 | ... | 12.7 |
| Light weight blotting | 17.8 | 15.8 | 8.2* | 16.7 |
| Coated cover | 25.0 | 24.3 | 17.1 | 22.0 |
| Cellophane | ... | 28.4 | ... | 27.5 |
| 25 per cent rag bond | 33.5 | 32.0 | 25.0 | 30.0 |
| Heavy blotting | 32.1 | 30.9 | 23.6* | 32.5 |
| 50 per cent rag bond | 41.6 | 40.2 | 35.2 | 36.7 |
| No. 2 kraft | ... | 54.1 | ... | 50.0 |
| Manila tympan | ... | 93.5 | 89.7 | 79.0 |
| No. 1 kraft | ... | 91.9 | ... | 83.8 |
| 100 per cent rag ledger | ... | 90.0 | 86.5 | 87.5 |
| 100 per cent rag index | ... | 114.9 | 113.1 | 109.5 |

* These results were outstanding and were rechecked.

* Presented at the Annual Meeting of the Technical Association of the Pulp and Paper Industry, Waldorf-Astoria Hotel, New York, N. Y., Feb. 17 to 20, 1936.

Proposed revision of TAPPI official method T403m. Submitted to the Paper Testing Committee by the Subcommittee on Physical Tests of Paper.

where a suitable instrument is not available, a conversion curve be drawn for the type instrument used and the type of paper tested and the results standardized with its assistance.

Some results are given herewith to indicate the comparison between the tests obtained from a motor driven Mullen instrument equipped with three carefully calibrated gages, the usual 150 pound, 40 pound and a 6 inch diameter 150-pound precision bourdon gage, and those obtained according to the foregoing method.

The differences are explainable by the differences of inertia of the gages used (the 6 inch gage has a comparatively large inertia), the friction of the needle spindles (almost absent in the 6 inch gage), the amount of air in the pressure system in the Mullen tester and the intensity of the jar occasioned by the rupture.

The usual way of using the Mullen tester is similar to the method described, except that pressure is applied to the underside of the diaphragm by forcing in glycerin at the rate of 75 cc. per minute which is equivalent to a hand wheel speed of 120 r.p.m. As may be seen from the above table the gage used should be that supplied by the makers. After calibrating the gage or replacing the diaphragm, enough glycerin should be added to leave the diaphragm slightly depressed with air bubbles absent. When the Mullen tester is employed according to the usual method then the results shall be expressed as "Points Mullen" not as "Pounds per square inch" unless the Mullen tester is operated according to the standard method.

### References

Carson, F. T. and Worthington, F. V., "A Critical Study of the Bursting Strength Test for Paper," Research Paper No. 278, U. S. Bureau of Standards.

Underhay, G. F., "Burating Tester Standardization" Proc. Tech. Sect. P.M.A., Vol. 11, Part 2: 247-264. (1931).

Clark, James d'A., "Determining the Bursting Strength of Paper," Tech. Assoc. Papers Series XV: 367-370. (1932).

# Determining the Stretch of Paper*

### Apparatus

The instrument used shall have:

1. Two clamps, the edges of the jaws of which are 180 mm. ± 0.5 mm. (7-3/32 ± 1/64 inch) apart, whose center surfaces shall be in the same plane parallel with the direction of motion of the applied stress and so aligned that they will hold the test specimen in one plane throughout the test.
2. Means of applying a predetermined initial tension to the test specimen when being clamped.
3. Means of applying a gradually increasing load to the test specimen until it breaks, the increase being such that the additional load applied in each second is not different by more than 5 per cent from the additional load applied in the previous second. (This condition is fulfilled by the usual pendulum type of apparatus.)
4. Means of indicating the elongation of the test specimen up to the instant of fracture to an accuracy of within 0.5 mm. (0.02 inch).

### Calibration

With the pendulum type of tensile apparatus adapted for the stretch test, a given movement of the stressing jaw away from the other jaw which is held fixed, shall correspond to the indicated reading on the elongation scale.

Unless the apparatus is altered in any vital way, there is no need to repeat the calibration once it is established.

### Test Specimen

The specimens for test shall be strips cut accurately and parallel to within 0.1 mm. (0.004 inch) and with clean edges, in each principal direction of the paper 12 to 25 mm. (½ to 1 inch) wide except for precise work when the width shall be 15 mm. (0.594 inch), to within 0.1 mm. (0.004 inch) and over 250 mm. (9.9 inches) long and shall have been sampled and conditioned according to the official methods.

### Procedure

The test shall be made in an atmosphere conditioned according to the official method.

An initial stress of 0.20 kilogram (0.44 pound) shall be applied to each strip while being clamped, unless for papers having a tensile strength of less than 2.0 kilograms (4.4 pounds) when two or three test specimens from the same sample of paper shall first be subjected to a preliminary tensile test and an initial tension equal to 10 (8 to 12) per cent of the average breaking load so determined, applied to each strip while being clamped. With apparatus in which the test specimen is clamped vertically, this is conveniently done by clipping to the end of the strip, a suitable weight.

After clamping under tension, the load shall be applied gradually until the specimen breaks, which shall occur in from 10 to 30 seconds from the time that the load commences, except for very precise work when fracture should occur near 20 seconds. (See notes). The elongation shall be recorded to two significant figures.

At least 10 and preferably 20 strips which are cut in each principal direction of the paper shall be tested.

If the mean value of the lowest and the highest reading differs from the average of all the readings by an amount more than 10 per cent, more specimens shall be tested until there is agreement within these limits. In the case of an irregular sheet of paper it may therefore be necessary to conduct a very much larger number of tests than ten. An isolated very high or low result which is not repeated should be discarded when a consistent average is obtained without the abnormal reading.

All readings obtained when the strip breaks in or at the jaws shall be rejected.

### Report

Results obtained on strips cut in the machine direction shall be reported as the percentage stretch, machine direction, and the results obtained on strips cut in the cross direction shall be reported as the percentage stretch, cross direction.

The report shall include the average test results expressed as a percentage to two significant figures, corrected if necessary, for calibration error.

If, for any reason, the specified length and width of specimens, or time to fracture has not been adhered to, the conditions actually employed shall be stated.

### Reproducibility of Results

Duplicate determinations of different sets of samples from the same shipment, and on different testing instruments are expected to agree to within 10 per cent unless the actual reading is less than 2.0 per cent when the results should agree to within 0.20 actual reading.

*Notes:*

The initial load of ½ kilogram or 10 per cent of the ultimate tensile

* Presented at the Annual Meeting of the Technical Association of the Pulp and Paper Industry, Waldorf-Astoria Hotel, New York, N. Y., Feb. 17 to 20, 1936.

Official method proposed by the Subcommittee on Physical Tests of Paper of the TAPPI Paper Testing Committee.

strength is given the specimen strips to remove any cockles and waviness which might be present and which, properly should not be included in the test for elongation. With most papers this small initial load will not cause any sensible extension beyond removing the defects mentioned. The value of the initial tension is not critical for flat papers.

The stretch test of many papers is influenced by the rate of loading and large variations of the stated speed should not be permitted for precise work. Doubling the rate of loading for some papers having a high stretch, might increase the result by over 5 per cent of the recorded amount.

With a pendulum tensile instrument, and with attachment for the stretch test and on which the average fracture of the specimens occurs with the pendulum near the center of the tensile scale, papers having tensile strengths falling within two-thirds of the entire range of the tensile strength scale will be in accordance with this method if the speed of the stressing jaw is fixed and is such that the pendulum reaches the center of the tensile scale in about 20 seconds.

If a lesser distance between the jaws is employed a higher test is expected, as the "percentage stretch of a paper" is an arbitrary value which includes both elastic and inelastic stretch and also a certain amount of the stretch after the initial fracture has been made. The latter quantity is appreciable and is independent of the length of the strip used, while the effect of the length of strip on the others is somewhat dependent upon the formation of the sheet. In addition, the accurate indication of stretch for strips much less than 180 mm. long is open to question unless unusually good apparatus is employed. Varying the width of the test specimen between 12 mm. and 25 mm., in general does not make much difference to the proportionate test results, except for unbeaten long fibred papers when the differences may be appreciable.

The test is designed to be carried out if desirable, at the same time as the official method for determining the tensile strength and for precise work the rate of loading may be adjusted as suggested in that method.

# Tensile Strength of Paper*

### Apparatus

The instrument used shall have:

1. Two clamps, the edges of the jaws of which are about 180 mm. (7-3/32 inches) apart, whose centers shall be in the same plane parallel with the direction of motion of the applied stress and so aligned that they will hold the test specimen in one plane throughout the test.
2. Means of applying a gradually increasing load to the test specimen until it breaks, the increase being such that the additional load applied each second is not different by more than 5 per cent from the additional load applied in the previous second. (This condition is fulfilled by the usual pendulum type of apparatus).
3. Means of indicating the applied load at the instant of fracture to an accuracy of within 2 per cent.

### Calibration

The machine shall be accurately leveled in both its principal directions and the mechanism cleaned and made to move freely. Dead weight loads shall be applied to the clamp actuating the indicating mechanism under conditions simulating the rate of loading of the paper strips. In the case of the pendulum type of tester, it is sufficient to wedge up the pawls holding the pendulum with a small piece of paper bent double, apply the test weights to the upper clamp and allow the pendulum to come to equilibrium from the direction in which it moves when the load is applied to it. A record shall be made of the deviations from the indicated readings and corresponding corrections made in the test results.

It is recommended that the instrument shall have been calibrated not more than one month prior to the test.

### Test Specimen

The specimens for test shall be strips cut accurately and parallel to within 0.1 mm. (.004 inch) and with clean edges, in each principal direction of the paper, 12-25 mm. (½ to 1 inch) wide, except for precise work when the width shall be 15 mm. wide (0.594 inch), to within 0.1 mm. (.004 inch), and over 200 mm., preferably 250 mm. (9.9 inches), long, and shall have been sampled and conditioned according to the official methods.

### Procedure

The test shall be made in an atmosphere conditioned according to the official method.

The test specimen shall be firmly and squarely held in the jaws of the clamps and the load applied gradually until the specimen breaks, which shall occur in from 10 to 30 seconds from the time the load commences, unless for very precise work, when fracture should occur near 20 seconds. (See notes). The breaking load shall be recorded to three significant figures.

At least 10 and, preferably, 20 strips which are cut in each principal direction of the paper shall be tested.

If the mean value of the lowest and the highest reading differs from the average of all the readings by more than 5 per cent, more specimens shall be tested until there is agreement within these limits. In the case of an irregular sheet of paper, it may therefore be necessary to conduct a very much larger number of tests than ten. An isolated very high or low result which is not repeated in duplicate, should be discarded when a consistent average is obtained without abnormal reading.

### Report

Results obtained on strips cut in the machine direction shall be reported as tensile strength, machine direction, and the results obtained on strips cut in the cross direction shall be reported as tensile strength, cross direction.

The results shall be reported as the average value of the breaking load per unit width, such as Kg/cm, or as Kg/15 mm., expressed to three significant figures.

### Reproducibility of Results

Duplicate determinations of the tensile strength from different sets of samples from the same shipment and on different instruments are expected to agree to within 5 per cent.

### Additional Information

BREAKING LENGTH.

The breaking length is the minimum length of a paper strip, which when suspended at one end, would break of its own weight. It is usually expressed in meters and may be calculated as follows:

$$\text{Breaking load for 15 mm. strip in kilograms} \times 200{,}000 \;\Big/\; \text{Basis weight in grams per square meter} \times 3$$

$$\text{Breaking load for 15 mm. strip in lbs.} \times 21{,}500 \;\Big/\; \text{Basis weight in lbs. } (25 \times 40\text{—}500)$$

*Notes:*

With the usual type of pendulum tensile tester, and the speed of the stressing jaw 12 inches per minute, a specimen will break in about 10 seconds if its strength is about half the total scale reading, or in about 30 seconds if the jaw speed is 4 inches per minute.

With a pendulum instrument on which the average results are obtained near the center of the scales, two-thirds of the range of both scales will be in accordance with this method if the speed of the stressing jaw is fixed and is such that the pendulum reaches the center of the scale in about 20 seconds.

Doubling the rate of loading may cause an increase of some papers by about 2 per cent, quadrupling by about 4 per cent and so on. It is evident that while the results are not particularly sensitive to the rate of loading, large variations from the stated range of speed should not be permitted for precise work.

For precise work the rate of loading or the speed may be varied either by altering the speed of driving the instrument, or, with the usual pendulum type of apparatus if a suitable pendulum weight is not available, the heavy slotted weight may be temporarily wedged with paper or otherwise fixed nearer the point of suspension of the pendulum and the scale recalibrated If the normal scale is accurate and the instrument is re-leveled after adjusting the weight, only a single calibration point (preferably taken near the working point) will suffice to give the required factor for converting the indicated reading to the true load. The pendulum arm ( ) ( ) may be conveniently marked at known ratio intervals so as to save recalibration.

If a lesser distance between the jaws is employed, a higher test is usual. For papers which have a poor formation, the difference between 100 mm. and the standard distance of 180 mm. may amount to over 10 per cent.

Varying the width of the test specimens between 12 mm. and 25 mm. does not in general make much difference to the proportionate test results except for unbeaten long fibered papers, when the differences may be appreciable.

* Presented at the Annual Meeting of the Technical Association of the Pulp and Paper Industry, Waldorf-Astoria Hotel, New York, N. Y., Feb. 17 to 20, 1936.

Proposed final revision of TAPPI Standard T404m by the Subcommittee on Physical Tests of Paper.

TAPPI SECTION, PAGE 124

# TAPPI Medal Is Presented to W. H. Millspaugh for Meritorious Service

William H. Millspaugh, prominently engaged for a long number of years in the development of paper making machinery, was presented the medal of the Technical Association of the Pulp and Paper Industry at the annual convention of the association for his important contributions to the technical progress of the industry. The presentation was made by William G. MacNaughton, assistant to Dr. Charles H. Herty, director of the Pulp and Paper Laboratory of the Industrial Committee of Savannah, Inc. Mr. Mac Naughton spoke as follows:

The TAPPI medal is awarded from time to time "to those whose achievements have definitely contributed to the technical progress of the pulp and paper industry." Thus far the award has been made four times: In 1928 to William H. Mason, and to Ogden Minton; in 1933 to Ernst Mahler and in 1935 to Edwin Sutermeister.

For 1936 the executive committee has decided that the award should be made to William H. Millspaugh, and it is my duty and pleasure today to make the formal presentation on behalf of the Technical Association.

In the previous awards the contributions to the industry's progress that have been recognized are the following:

First, the Mason process for defibering wood by the use of high pressure steam and the development of the novel and highly useful product known as "Presdwood;"

Second, the Minton vacuum drier for drying paper and pulp in a continuous web at low temperature under vacuum;

Third, the commercial development of many paper products new to this country, particularly ground wood-content papers for photo-gravure printing, and the product made from bleached wood pulp known as Cellucotton, the application of technical knowledge and scientific research to pulp and paper manufacture, and the development of a number of instruments for technical control; and

Fourth, the development of the pebble mill test for evaluating pulp quality and the extension of the technical knowledge through publication of several valuable works on the industry.

WILLIAM H. MILLSPAUGH

Gets TAPPI Medal for Contributing to the Technical Progress of the Pulp and Paper Industry

The fifth award, that of the 1936 TAPPI medal to be presented today, recognizes as an important contribution to the technical progress of paper manufacture the design of the Millspaugh suction roll and its world-wide application as suction couch and suction press, and as the essential feature of the Millspaugh vacuum-forming paper machine.

On such an occasion as this it would be proper to review briefly the progress of the industry during the period of Millspaugh's connection with it as a designer and inventor of machinery. Such a review cannot be complete, however, or exhaustive, and some things of importance will probably be overlooked while it may be considered others are overemphasized.

### Raw Materials

Wood has been, and still is, the chief source of raw material for paper. According to all available evidence wood is likely to so continue in the future. A notable advance in this country has been the increasing co-ordination of sawmills and pulp mills (long seen in Scandinavian countries) whereby slabs, mill ends and other waste of sawmills, as well as low-grade logs, are used for pulp instead of going to burners. Another is the discovery that the southern pine under heartwood age are rapidly prepared by the sulphite process.

The periodic attempts to use for paper the waste of annual crops such as cereal straw, cornstalks and sugar cane have shown conclusively that this material is, for economic reasons, suitable only for fiber insulation.

While somewhat out of place at this point, the development of fiber insulation has itself been one worthy of mention in a review of technical progress. Made first from laminated ground wood sheets, as in Beaverboard; then from ground wood screenings, as Insulite; and later from sugar cane waste, as Celotex; from defibered wood, as Masonite, and others, there being numerous other fiber insulation products from otherwise waste fiber material.

### Wood Preparation

In the preparation of the wood for pulp the chief outstanding advance, and one worthy of note, has been the development and application of the continuous barking drum.

In the course of a very few years the equipment and practice of the industry for wood preparation were entirely changed. At the same time, while the waste of wood was reduced considerably, the barking drum introduced a new problem—that of disposal of the wet bark. Antedating the continuous barking drum were intermittent closed drums which had paved the way for it as in showing a saving in labor and wood.

### Ground Wood

Until the study on grinding wood for pulp made in 1912 by the Forest Products Laboratory for the paper industry in a laboratory established in Wausaw, Wis., there was little exact knowledge of the ground wood process. In this work, besides determining the factors entering into

the production of ground wood there was demonstrated the suitability of many kinds of wood previously ignored.

Following this study a number of test methods and instruments, particularly the freeness tester, were perfected and have become standards for ground wood technical control.

In the field of production, particularly since the advent of grinders of large size and capacity, the development of pulp stones made from artificial abrasives must be noted, since they have proven a serious competitor of the natural sandstone.

The design of magazine grinders, intermittent and continuous types, has become firmly established and, except in small plants, these have displaced the handfed pocket type.

### Chemical Pulp

Until shortly after the beginning of the century, soda and sulphite were the only chemical pulp processes known. Soda then, as now, was largely confined to pulping hardwoods, and the sulphite used for pulping conifers. The first notable technical advance was the invention of the sulphite process and its introduction to this country about 1904. It has become the chief process for pulp used for wrapping, bag paper and boards requiring strength and toughness with light weight.

These three processes still remain the chief ones in general use, although others have been developed and, to a certain extent used, such as the Keebra, sodium sulphite, combinations of the acid and alkaline processes, several types of semi-chemical where the wood is treated with chemicals, water and steam, in combination with the application of power by some means, to defiber the wood.

### Sulphite

In the sulphite process the notable developments have been along mechanical and equipment lines, making use of materials and devices that could be applied with advantage.

There have been improvements in equipment for burning sulphur and in acid absorption systems using both lime and limestones. Through the development of the corrosion resistant ferrous alloys, forced circulation and external heating have been applied to sulphite digesters.

For digesters on which direct steaming is used, equipment has been devised for conservation of the heat and chemicals in the relief liquor and gas.

These, as well as the development of automatic digester operation through application of control instruments, all show that in the sulphite process the industry has kept pace with other industries.

A notable contribution to the technical progress of this phase of pulping was the work of Miller Swanson and others in the Forest Products Laboratory on the sulphite process. These studies covered several years and are fundamental in character. The waste liquor problem at last appears to be solved by the profitable method of separation of the solids and then use by the mills.

### Soda and Sulphate

It has been chiefly in the field of chemical recovery and heat conservation that the most notable advances in these processes are to be seen. These include the use of multiple-effect vacuum evaporations and the spraying of the concentrated liquor into furnaces where the remainder of the water is driven off, the carbonaceous matter burned and the chemicals reduced in a molten condition. The modern recovery furnace is attached to a boiler so that the heat of combustion is used for generation of steam sufficient in general for cooking and evaporation. Electrical precipitation of the chemicals in the stack gases is also customary.

Another advance is the recovery of the lime used for causticising by burning the sludge or its recovery as calcium carbonate after purification.

Other by-products to some extent recovered where resinous wood is digested are the wood turpentine and the talloel, which have industrial uses.

### Bleaching

It is in bleaching and other purification treatments of the chemical pulps that recent years have shown the most marked advances in the paper field. Such products as pulp for viscose rayon and the transparent cellulose sheets, wood pulp of high alpha cellulose content for special uses are outstanding achievements.

In the bleaching process the first change came early in the war period when liquid chlorine replaced bleaching powder in the mills. Then there was the development of high density bleaching using different types of mixing equipment, and more recently, the adoption of multi-stage bleaching combining direct chlorination with calcium or sodium hypochlorite bleach and washing between the different stages. Besides an economy of chlorine it is said that pulp of higher quality is obtained.

### Paper Making

For stock preparation, although there have been many changes throughout the years in the design, the beater and the Jordan still reign supreme. It is on the paper machine, with the enormously increased width and at the same time the doubled and trebled speed of operation, that the most marked advances are to be seen.

In the case of the Fourdrinier the increase in the width and the consequent increase in the weight resulted in the invention of the removable Fourdrinier whereby wires can be changed with small loss of time without dismantling the wet end.

As the machine speed increased a great aid to economy and operating uniformity was the development of the Trimbey stock consistency controller and metering and proportioning system and also the continuous return to the system of the fiber and fines of the white water formerly largely wasted.

Considering the increase in machine speed and also the continuity of operation, it can be shown that without the Millspaugh suction couch and suction press they would not have been as easily possible. It was fortunate for Millspaugh that the industry was thinking of increased speed about the same time that he was trying to develop his suction roll and apply it as a suction couch. In consequence of the desire for speeds greater than perhaps 400 f.p.m., paper mills were receptive to any proposals. The suction couch was shown to be a means of getting rid of one source of trouble—the jacketed top couch roll. When the suction couch was installed other advantages were found, such as the ability to increase the speed to make heavier papers on the Fourdrinier without crushing, lengthened wire life by decreasing the wear of the wire on the flat boxes, and many more.

When speeds higher than 600 f.p.m. were tried it was found necessary to balance all the rolls, equip the machine with machined gears and in general apply much more accurate machine work. With the gradual development of the sectional motor drive with speed adjustment control the use of anti-friction bearing rolls balanced for the designed speed the paper machine became what it is today. At the same time it must be remembered that included as part of the standard equipment are the suction couch and two suction presses.

Considering the interferences to continuity of operation, the most important before advent of the suction couch and press were wet breaks at the couch and breaks at the presses, usually due to the felts becoming filled up. It was customary to allow two to two and a half hours in each 24-hour day for washing felts, wire and jacket. At first continuous or intermittent felt washers were applied but with the advent of the suction couch it was possible to reduce the washing time to about one hour or an hour and a half. Now when both presses are equipped with suction rolls it has become customary to run continuously and confine washing period to week-ends or necessary shut downs.

Other important operating aids to speed and continuity of operation are the high stock inlet, the Sheehan carrier ropes and the Pope air system for web transfer.

It is not my desire to give all the credit to the suction roll for the phenomenal increase in paper machine speed and operating continuity, nor do I believe that Millspaugh would accept it if I did so. I am satisfied, however, that we can all agree that of all the factors contributing to the present high speed and operating continuity, Millspaugh's suction roll as couch and suction press has been the most important.

When a few Fourdrinier machines had reached about 1200 f.p.m. operating speed Millspaugh developed his conception of a paper machine capable of still higher speed, perhaps 2500 f.p.m. It is interesting, however, to recall that he had in his mind as early as 1912 the idea to apply his suction roll with two suction areas as the forming part of the paper machine and for presses to superimpose two or three suction press rolls. A small machine but of commercial size with three vacuum forming rolls was set up in 1927 or earlier, in his plant in Sandusky, Ohio; on it was demonstrated various standard grades of paper, as well as special ones, for which the machine is especially adapted.

Although I believe two of the Millspaugh vacuum forming machines have been installed and have operated for several years, it has not yet had the opportunity to show its potentialities for speed.

Before making the presentation it may be truly said that the technical progress of the industry has come about largely through the union of interest and action of those whose work is in pulp and paper and those in the allied industries engaged in the design and development of equipment applicable to the industry.

Mr. W. H. Millspaugh, I have pleasure, on behalf of the association, in presenting you with the TAPPI medal, the 1936 award of merit.

### Mr. Millspaugh's Acceptance

Mr. Millspaugh in accepting the medal spoke as follows:

I am appreciative of the honor bestowed upon me on this occasion, by the Technical Association of Pulp and Paper Industry. I greatly appreciate what my friend, Mr. MacNaughton, has said of my contribution to the mechanics of the paper making art. He is a generous soul. This is not the first time that he has expressed himself on the subject. Perhaps these former expressions may have influenced his selection by your association to speak for them on this occasion. The pulp and paper industry owes me nothing. Long before the organization of the technical section, paper manufacturers throughout the country had been exceedingly kind to me and rendered me encouragement and assistance in many ways.

### First Contact with Industry in 1895

My first contact with the paper industry was in 1895 while a salesman for Deming Pump Company of Salem, Ohio. The Demings made a good triplex pump. I had heard much of the field for such pumping equipment in the paper industry. I had never seen a pulp or paper mill, had not the faintest idea of what it was like. In later years the incidents of my breaking into the industry have been a source of amusement to me. Fulton, New York, was the nearest pulp and paper town to my home. Mr. Wells was the manager of a pulp mill. He listened graciously to my story of Deming pump superiority, took me into the pulp mill, showed me numerous pumps he was using, told me the number of grinders and the pockets of each and asked for recommendations and quotations. As I did not know that wood was ground into pulp nor the functions of a grinder, my recommendations would hardly have been satisfactory to the situation. With an excuse that I wished to get some additional data from the factory and that I would return one of the following days, I left Mr. Wells.

Everyone knew that Watertown is an important pulp and paper center at that time so to Watertown I went. Upon arrival at the Woodruff Hotel I asked the clerk: "Who is the kindest of well-informed paper and pulp manufacturers in this city? His reply was that Mr. George Knowlton best answered that inquiry. Mr. Knowlton graciously received me. I told him of my dilemma, that I knew nothing about pulp grinding nor the function of the pump but that I was very desirous of making a sale to Mr. Wells. With a hearty laugh he took me to the pulp mill, explaining that his grinders were not of the conventional type as the stones were mounted on a vertical rather than a horizontal shaft, but that would make no difference in answering my questions.

### Has Hearty Laugh with George Knowlton

From an hour or more of questioning and listening, with more or less figuring, I returned to Mr. Wells full of the subject and was told that I could have the order if I could find a convenient place to erect the pump, where it could be piped to the grinders without shutting down the mill. I left Fulton with the order, returning to Watertown, where I reported to Mr. Knowlton, who had a hearty laugh with me. Fortunately, that day I sold another pump at Brownville, and that evening met Mr. Clarence Kinnie. This meeting was the beginning of another treasured friendship. He told me of a new pulp mill being built by Mr. G. H. P. Gould and advised me that Mr. Gould was rather decided in his business ways. However,. notwithstanding my call was at an inopportune moment and that I was able to add a few good expletives to my vocabulary, we did business, and I never had a better friend in the trade.

With this encouragement, in a few days I arrived at Ticonderoga where Mr. Jefferis fortunately needed some pumps which he purchased of me. On this occasion I met that prince of good fellows and fine paper and pulp maker, Mr. Tom Warren, whose friendship all during his life was marked. Mr. Fred Richards was another of the early Ticonderoga friends. Leaving there and going to Hudson Falls, I spent several days at the pulp mill managed by Mr. Kenyon, later owned by Union Bag and Paper Company. By this time I was full of enthusiasm for power saving through the use of triplex pumps versus centrifugal pumps then in common use. I spent several days at Hudson Falls making short shower pipes and testing them for water consumption at different pressures, selling the largest double-acting triplex power pump the Deming people manufactured to supply water for the wet machines.

### Sells Many Pumps

Then I met Mr. Fred Parks of Glens Falls. I told him I believed I could make a shower pipe that would do the

work better and require less water and less power. He was interested and after explaining my idea he said: "That is just what we want. I will introduce you to my brother, George, and to Will Scoville, and you may have No. 5 machine to experiment on. If it works out satisfactorily we will give you considerable business." Eventually the shower pipes there installed were found to have accomplished what was expected of them. Messrs. Fred and George Parks were among my staunch friends in those early days. On this, my first trip to the paper mills, I sold more power water pumps than on any subsequent trip, and developed shower pipe business which was quite generally adopted and eventually earned the money permitting the establishment, in a small way, of my own manufacturing business, the Sandusky Foundry and Machine Company.

### Some Outstanding Men in the Industry

It is obvious that it was easier in those days to introduce new ideas that it was at a later date. I have only pleasant memories of the succeeding years. However, I am impelled to mention a number of paper makers, a few friends who were always gracious and helpful. Mr. John Warren, Cumberland Mills, Me., was one of the few trained engineers in the paper industry at that time. He always had time for young men and a word of encouragement; Mr. George Whiting, of Menasha, Wis.; Mr. Harry Mead, prince of good fellows, father of George Mead, who, like Harry Gould, continued the friendships of their fathers; Mr. Chisholm, and particularly Mr. Phillip Dodge of the International Paper Company. Mr. George Harvey and his father, of the Gardner Paper Company, Middletown, Ohio; Frank Smith, also of Middletown; Mr. Peter Thompson and his sons, of the Champion Coated Paper Company; Mr. Harris of the Oxford; Mr. Bache-Wiig; Mr. Frederick C. Clarke; Mr. Samuel W. Simpson of the Bardeen Paper Company, Otsego, Mich.; David Luke and his brothers, Arthur Hastings and Superintendent Mike Argy; Mr. Frank Hodge and Mr. Noah Bryant of Kalamazoo; Mr. George Bidwell of Warren Manufacturing Company.

### Howard Parker Among Early Acquaintainces

Among my earlier acquaintances in New England was Howard Parker, then at Bellows Falls. He was one of the early manufacturers of suction rolls, always generous and encouraging to friends and one of the finest mechanics and inventors that it has been my privilege to know in the pulp and paper industry. The paper tube making machine developed and manufactured by him is the cleverest and most practical machine ever built for the paper industry. Mr. C. S. Hammersley, one of my dearest and perhaps most helpful friends, who gave me the opportunity for trial of suction couch roll with rotary pumps. There are many friends, some living, but the greater majority of those whom I knew thirty or forty years ago have passed on. I have mentioned enough of these early friends to justify the statement that the paper industry owes me nothing.

The industry has been universally kind to those who represented me in the sales field. I only hope that the young chaps who have ideas that may prove of value to the industry may in the future receive the same kind treatment. When I sold the Sandusky Foundry and Machine Company to the present owners, I continued to hold all foreign rights in my patents and processes. In the establishment of my business in England and in meeting with the paper industry, particularly with the Technical Association I have been most graciously received, as has been the case in many European countries. The manufacture of pulp and paper evidently contributes to good fellowship.

### Visualizes More Efficiency

Enough of retrospect. I am frequently asked why, having retired from the paper industry in the United States, I should again engage in manufacturing abroad. To those likely to be really interested my reply has been that I visualize paper machine assemblies simpler and more efficient than those in present use; that I am having greater pleasure in these further developments than in fishing, and that I am keenly interested in further development of the production of steel by centrifugal processes started at Sandusky. These developments are coming along in a satisfactory manner, and I am looking forward to rounding out my mechanical experiences with these further contributions to the two industries that hold my fancy.

Aside from the honor conferred upon me today by the Technical Association, it is a very great pleasure to again attend an annual meeting of the paper industry of the United States. For thirty years I seldom missed this annual gathering and I trust that there will be other occasions.

## Annual Luncheon of Technical Association

TAPPI becomes of age! The twenty-first annual luncheon of the Technical Association of the Pulp and Paper Industry was held in the Grand Ball Room of the Waldorf-Astoria Hotel, Thursday, February 20, and was very largely attended.

Clark C. Heritage, the retiring president of the Association, presided, and introduced first the newly elected president of TAPPI, Grellet N. Collins. Mr. Collins, after a few words of greeting, said "that if my administration is as successful as the past president's, I will consider I have done a good job. I want to say that the association is well represented by every section of the country now and we want to keep it as highly representative of all sections as it is possible and that means that every individual is invited to show his interest in the coming year in any of the subjects which may be of special importance to him."

A visitor from across the seas was next introduced by Mr. Heritage in the person of Leslie G. Cottrell, of Albert E. Reed, Ltd., of London, Mr. Cottrell thanked TAPPI and its friends for their kind welcome and extended an invitation to attend the British Technical Section meetings next month in England.

Chas. Champion, president of the American Pulp and Paper Mill Superintendents Association, acknowledged his introduction at the luncheon and extended a cordial invitation to the next national meeting of the association at Grand Rapids in June.

Mr. Heritage then introduced a Canadian visitor, R. A. McInnis, general manager of the Anglo-Canadian Pulp and Paper Mills, Ltd. Mr. McInnis is also president of the Canadian Pulp and Paper Association and a past president of the Canadian Technical Section.

F. J. Sensenbrenner, president of the American Paper and Pulp Association, was then introduced. Mr. Sensenbrenner extended the greetings and best wishes of the parent association for continued success in promoting the progress of the industry and congratulated the association on its rapid growth from a small beginning twenty-one years ago.

One of the main features of the TAPPI luncheon was the presentation of the TAPPI gold medal to William H. Millspaugh for his invention of the suction roll and its application to the paper machine. The presentation was made by William G. MacNaughton, who reviewed briefly the progress of the industry during Mr. Millspaugh's connection with it as designer and inventor. Mr. MacNaughton's

presentation speech and Mr. Millspaugh's acceptance are printed in full elsewhere in this issue.

At this point Mr. Heritage read a radiogram received from the British Technical Association, addressed to the Technical Section as follows: "We send greetings to all and congratulations to William Millspaugh on receiving the well-earned recognition of the TAPPI gold medal."

Frank E. Gannett, of the Gannett Newspapers, Inc., Rochester, N. Y., was the featured speaker at the luncheon. Mr. Gannett's subject was "Tomorrow's Money." He first went into a short discussion of Today's Money, particularly the standard value of gold and its monetary effect on business and on the woodpulp business, which is international. "Tomorrow's money," Mr. Gannett said, "will not be the gold standard money we used to know. It will be money managed to keep it stable in purchasing power, managed so as to prevent disastrous inflation and equally disastrous deflation." Mr. Gannett went on to say that we shall never have sound money until we have the intelligence to manage it in accordance with enlightening monetary science."

Mr. Heritage announced to those attending the luncheon meeting that the Fall Meeting of TAPPI this year would be held in Montreal, Canada, the first week in August.

## American Pulpwood Association

The annual meeting of the American Pulpwood Association was held in the Waldorf-Astoria on Thursday, when the officers for the coming year were elected as follows:

President, Major R. R. Spessard, N. E. Spessard & Sons; First Vice-President, Charles W. Luke, West Virginia Pulp and Paper Company; Second Vice-President, D. S. Field, Field Pulpwood Company; Secretary-Treasurer, William P. Good, 220 East 42nd street, New York.

Directors: W. R. Brown, D. F. Field, W. L. Cobb, Wm. Caprio, K. A. Swanning, C. K. Luke, A. L. Clarke, C. E. Smith, Wm. Bonifas, W. T. Gorman, D. C. Everest, J. V. Martin, J. H. Friend, J. F. Kelly, Ellis Olsson, Wm. S. Mundy, D. S. Denman, A. B. Lowenstein, Eli Woolworth, H. E. Beedy, R. H. Spessard, C. O. Brown, J. O. Lynch, G. N. Ostrander, C. W. Alden.

## Sulphate Pulp and Board Association

H. W. Ellerson, of the Albemarle-Chesapeake Corporation, was elected president of the American Sulphate Pulp and Board Association at its annual meeting held Wednesday at the Waldorf-Astoria Hotel. S. M. Phelan, of the West Virginia Pulp and Paper Company, was elected vice president, and S. M. Hudson is secretary-treasurer of the association.

Members of the Executive Committee are: H. W. Ellerson; S. M. Phelan; H. L. Brown, Brown Paper Mill Company; R. J. Cullen, Southern Kraft Corporation; D. C. Everest, Ontonagon Fibre Corporation; J. P. Hummel, Hummel-Ross Fibre Corporation; H. L. Wollenberg, Longview Fibre Company; J. D. Zellerbach, National Paper Products Company; A. C. Goodyear, Bogalusa Paper Company.

## Paper Merchants Enjoy Frolic

Relaxation from the strenuous proceedings of convention week was afforded by a large party given in the French Casino, New York, by the National Paper Trade Association of the United States.

The performance, entitled "Folies des Femmes," is claimed to be the best night club girl show in town and was thoroughly enjoyed by all present.

## Paper Stock Dealers' Banquet

The New York Association of Dealers in Paper Mill Supplies, Inc., held its twenty-eighth annual banquet in the Hotel Commodore on Wednesday evening. The attendance and enthusiasm of the members and their guests marked the banquet as one of the most successful ever held. After the superb menu there was an excellent variety show by a galaxy of stars of the stage and screen, aided and abetted by the irrepressible "Frank" and "Johnny" Burke. Tables were reserved for the following Companies:

Arrow Waste Paper Company, Thomas Barrett & Company, D. Benedetto, Inc., A. Bloch & Company, C. F. Bradley, C. J. Browne, Cantasano & Bros., P. Cardinale & Son, James Carrano & Son, Crosby Paper Stock, Darmstadt, Scott & Courtney, Economy Baler Company, Ethyl Mill Supply Company, Gaccione Bros. & Company, Giove Company, Inc., Globe Mill Supply Company, H. Goldman & Company, Louis Gottlieb & Bros., Daniel M. Hicks, Inc., E. J. Keller & Company, Charles Maronna & Company, Charles Mastronardi, George W. Millar & Company, Inc., L. & R. Moelis Company, A. J. Moran & Company, Inc., National Association of Waste Material Dealers, Martin Patricof, Republic Paper Stock Company, S. Shapiro & Sons, W. Steck & Company, Sterling Mill Supply Company, Valva Paper Stock Company, Whaling Waste Products Company, and Wilson Paper Stock Company.

## Book Paper Manufacturers Association

Charles A. Gordon, of the Oxford Paper Company, was elected chairman of the Book Paper Manufacturers Association at the annual meeting held Thursday at the Waldorf-Astoria Hotel. W. T. Schmitt, Bryant Paper Company, was elected vice-chairman. P. H. Glatfelter was reelected treasurer. R. S. Berry is secretary of the Association.

The directors for two years are: J. R. Miller, West Virginia Pulp and Paper Company; J. H. Fearing, International Paper Company; A. E. Curtenius, Kalamazoo Paper Company.

The directors named for three years are: Clarence A. Clough, New York and Pennsylvania Company; George K. Ferguson, Watervliet Paper Company; Roger D. Smith, S. D. Warren Company; P. H. Glatfelter, P. H. Glatfelter Company.

## Waterproof Paper Mfrs. Association

The general meeting of the Waterproof Manufacturers Association was held in the Waldorf-Astoria on Tuesday afternoon. Officers for the coming year were elected, as follows:

President, F. E. Rothermel, Crepe Kraft Company, Newark, N. J.; Vice-president, A. M. Anderson, Sisalkraft Company, New York; Executive Committee: Frank E. Donovan, Specialties Converters, Inc., Boston, Mass.; A. M. Anderson, Sisalkraft Company, New York; Fred. P. Wood, Simplex Paper Corporation, Adrian, Mich.; J. D. Young, Edgewater Paper Company, Menasha, Wis.

## Paper and Twine Club Dines

The Paper and Twine Club, which was organized last Fall for social purposes exclusively, so that manufacturers and converters might become better acquainted, held its first annual luncheon Wednesday, February 19, at the Hotel Shelton. This initial get-together was well-attended and promises a good future for the club. C. J. Wittrock, of the Paragon Paper Company, is president and John Richey serves as secretary.

## To Hold Conference March 18th

One of the most important and outstanding features of the program for the Twenty-third Annual Convention of the National Association of Waste Material Dealers, Inc., which is to be held at the Hotel Astor, March 16 to 18, inclusive, will be a joint conference sponsored by the Associated Rag Industries, a division of the National Association of Waste Material Dealers, with the Writing Paper Manufacturers Association. The conference is to be held on the closing day of the convention, Wednesday, March 18, starting at 10 A. M.

The conference will differ somewhat from the one held in Holyoke two years ago in that the program will be along educational lines in the hope that at the close of the conference both dealers and paper manufacturers will have a better understanding of each other's problems.

New and constantly changing conditions in the type of material from which rags, and particularly cuttings are produced, are bringing problems to the paper manufacturer which are far-reaching and in many cases of equal importance to the dealers. In the preparation of the program E. H. Naylor, executive secretary of the Writing Paper Manufacturers Association, and his assistant, Morris C. Dobrow, are co-operating with the president and executive secretary of the Associated Rag Industires, Joseph Schapiro and Charles M. Haskins, respectively.

Some interesting papers will be presented bringing out both dealer and consumer problems and at the conclusion of the conference members of the Writing Paper Manufacturers Association attending will be guests of the National Association of Waste Material Dealers at an informal luncheon.

An invitation has also been extended to the Felt Manufacturers Association to participate in the conference and it is expected that a good number of members of that association will also attend. All important interests in the Cotton Rag Trade have indicated that they will attend the conference.

## Paper Shipping Sack Association

One of the most interesting meetings of the week was that of the Paper Shipping Sack Manufacturers Association, which was held at the Hotel Biltmore, New York, on Wednesday morning. Paper and pulp manufacturers are asked to help materially to increase kraft paper consumption by specifying delivery of their raw materials, wherever possible, in paper shipping sacks, which are clean, strong and thoroughly dependable.

The officers of the association are: President, W. J. Dixon, St. Regis Paper Company, New York; Vice-President, P. T. Sowden, Arkell & Smiths, Inc., New York. Executive Secretary, Frank Pocta, Room 1,000, 370 Lexington Avenue, New York.

## Newfoundland Increases Production

Both newsprint mills in Newfoundland report increased production during the first 11 months of 1935 over the corresponding period in 1934, according to reports from Consul General Harold B. Quarton, St. John's. Estimates of both companies are that the aggregate output during the past year will reach a figure of 314,700 short tons as against 302,000 tons during 1934. Both companies in 1935 inaugurated winter shipping ports, one at Port aux Basques and the other from St. John's. The Newfoundland Railway built special warehouses and arranged storage facilities to expedite these shipments.

## New Rayon Handbook

A second and enlarged edition of the Rayon and Synthetic Yarn Handbook has just been issued. This is a practical reference book for the producer, manufacturer, distributor, economist and student interested in rayon. It has been prepared by E. W. K. Schwartz, textile chemist, and H. R. Mauersberger, textile consultant. It has 550 pages and 230 illustrations.

The extraordinary acceptance of the first edition resulted in its entire disposal. The advance in the industry has required the rewriting of most of the material and the enlarging on several subjects. Among the features of this edition is a complete and accurate historical account of the American Rayon industry. A section on cellulose has been written to precede the raw materials for the manufacture of rayon yarns. The viscose process is described technically by H. B. Volbrath, consultant. The technical description of the cellulose acetate process is written by Harold D. Smith, and the cuprammonium process is recounted by Theodore Wood. There is a chapter on Cellulose from Chemical Wood Pulp by Sigmund Wang of the International Paper Company.

Copies may be obtained from the Book Department of the Technical Association of the Pulp and Paper Industry, 122 East Forty-second street, New York, N. Y., for $3.75 per copy.

## New Underground Pipe Line Insulation

A new insulation known as ADSCO Cell-Concrete, for underground steam and hot water pipe lines, possessing low heat conductivity, and the ability to retain its physical strength and shape, as well as completely regain its insulating value after repeated submergence in water, is being offered by the American District Steam Company, North Tonawanda, N. Y.

ADSCO Cell-Concrete is made entirely from Portland Cement, mixed with a foam, producing a light-weight cellular concrete of a specific gravity of approximately 0.3. It can be mixed on the job and poured around one or more pipes in conduits of various constructions at low cost, resulting in a rigid, permanent installation.

ADSCO Cell-Concrete has been used in Europe for over 10 years to insulate underground steam and hot water pipe lines, and after extensive tests by ADSCO Engineers, it is being installed in the United States for similar insulating purposes. Complete details and illustrations of ADSCO Cell-Concrete construction are available by addressing the American District Steam Company, North Tonawanda, N. Y.

## New Waterous Flat Screen

The Montague Machine Company of Turners Falls, Mass., have just issued a bulletin on their new Waterous flat screen, whose operation they describe as "screening with piston-stroke precision." Eccentrics mounted on the main shaft, instead of cams, operate the diaphragms. This, the makers claim, produces a silence of operation that is astonishing, and the silence is said to indicate decreased power needs, decreased wear on parts and increased efficiency of suction. Another special feature is the cushioning of the diaphragm carrier, which is designed to eliminate weaving motion and give constant full suction. Still another new development is the sectional construction of the main shaft, to facilitate repairs and avoid shutting down a line of screens. Full data may be obtained by writing to the Montague Machine Company, Turners Falls, Mass., and asking for the Waterous screen bulletin.

# Lake States Section of TAPPI Discusses Color Measurement

The regular meeting of the Lake States Section of the Technical Association of the Pulp and Paper Industry was held Tuesday, Feb. 11, 1936 at 6:00 P.M., at the Conway Hotel in Appleton, Wis., with Sidney D. Wells of the Combined Locks Paper presiding.

### Color Measurement

The speakers of the evening were: J. A. Van den Akker and Philip Nolan of the Institute of Paper Chemistry, who presented a joint paper on "Color Measurement." Dr. Van den Akker introduced the subject with a general discussion in which the basic concepts were defined. The speaker continued with an outline of the principles used in measuring color by means of improved spectrophotometers as adapted for use in the paper industry.

Technical applications of the methods of color measurement were then discussed by Dr. Nolan. For demonstration purposes an optical system involving an integrating sphere was used. This apparatus proved to be unique in matching the color samples by their spectral distribution curves in such a way that all those present could observe simultaneously.

Approximately 90 members and guests were present including:

Reinhold Vogt, Consolidated Paper Corporation, Wisconsin Rapids, Wis.

C. R. Morse, The Wisconsin River Paper and Pulp Company, Stevens Point, Wis.

H. C. Sperka, Thilmany Pulp and Paper Company, Kaukauna, Wis.

E. O. Bryant, Institute of Paper Chemistry, Appleton, Wis.

Wm. J. Plank, Jos. J. Plank & Co., Appleton, Wis.

Ward Harrison, Institute of Paper Chemistry, Appleton, Wis.

Robert E. Kissel and Ervin J. Vickman, Hoberg Paper and Fibre Company, Green Bay, Wis.

Earl F. Anderton, John Spalding, T. Richard Probst, August Erspanier and B. L. Browning, Institute of Paper Chemistry, Appleton, Wis.

W. F. Spengeman, A. E. Bachmann, A. D. Wilkinson, S. C. Flick, J. R. Fanselow and R. J. Zaumeyer, Kimberly-Clark, Corporation, Neenah, Wis.

Herbert T. Holbrook, Wadhams Oil Company, Milwaukee, Wis.

William E. Hornbeck, A. R. Ellis, C. Riggles and A. W. Redline, Kimberly-Clark Corporation, Appleton, Wis.

R. D. McCarron, Wisconsin River Paper and Pulp Company, Stevens Point, Wis.

Clayton Ewing, Menasha Products Company, Menasha, Wis.

W. H. Graebner, Marathon Paper Mills Company, Rothschild, Wis.

Marshall H. Smith, Menasha Products Company, Menasha, Wis.

Frank A. Whittiger, Ciba Company, Chicago, Ill.

James B. Clarke, National Aniline and Chemical Company.

H. C. Webber, Munising Paper Company, Munising, Mich.

Walter C. Christensen, Hoberg Paper and Fibre Company, Green Bay, Wis.

Harold Woehler and I. R. Valentine, Jr., Fox River Paper Company, Appleton, Wis.

James E. Watson, Wisconsin Wire Works, Appleton, Wis.

F. E. Greenwood, Munising Paper Company, Munising, Mich.

G. F. Enderlein, Mosinee Paper Mills Company, Mosinee, Wis.

A. T. Gardner, Combined Locks Paper Company, Combined Locks, Wis.

Earl R. Williams, Neenah Paper Company, Neenah, Wis.

Fred Bentzen and Wallace de Ves, Kimberly-Clark Corporation, Neenah, Wis.

John H. Graff, Institute of Paper Chemistry, Appleton, Wis.

Ernest B. Morse, The Fannon Trading Company, Appleton, Wis.

Hans John, Kimberly-Clark Corporation, Appleton, Wis.

C. E. Saecker, Appleton, Machine Company, Appleton, Wis.

John Tongren, Institute of Paper Chemistry, Appleton, Wis.

Kermit E. Olson, Tomahawk Kraft Paper Company, Tomahawk, Wis.

C. R. Seabourne, Thilmany Pulp and Paper Company, Kaukauna, Wis.

E. A. Gritzmacher, Marathon Paper Mills Company, Menasha, Wis.

Ronald L. Youngson, Marathon Paper Mills Company, Menasha, Wis.

Daniel R. Moltzan, Alan M. Glover, Allan K. Smith, George L. Clarke and Linton Simerl, Institute of Paper Chemistry, Appleton, Wis.

Paul Grady, Kimberly-Clark Corporation, Neenah, Wis.

Stephen Kukolich, Neenah Paper Company, Neenah, Wis.

W. V. Drake, A. W. Neubauer, Willmer Wink, Chas. A. Richardson, Gerald Johnston, James R. Lyon, Louis B. Taylor, J. C. Barthel, Phil Dixson, Raymond E. Baker and N. A. Koclson, Institute of Paper Chemistry, Appleton, Wis.

A. J. Detrie, Standard Oil Company, Green Bay, Wis.

K. R. Wink, Kimberly-Clark Corporation, Neenah, Wis.

S. I. Aronovsky, Institute of Paper Chemistry, Appleton, Wis.

Myrl N. Davis, Kimberly-Clark Corporation, Appleton, Wis.

Philip Nolan, Institute of Paper Chemistry, Appleton, Wis.

S. D. Wells, Combined Locks Paper Company, Combined Locks, Wis.

Howard Morgan, Institute of Paper Chemistry, Appleton, Wis.

Russel LeRoux, Consolidated Water Power and Paper Company, Interlake Div., Appleton, Wis.

Edward H. Voigtman, Kimberly-Clark Corporation, Neenah, Wis.

R. W. Van Kirk, Penick & Ford, Ltd., Cedar Rapids, Iowa.

A. T. Brainerd, Ciba Company, Chicago, Ill.

H. Don Purdy, Supt. Tuttle Press Company, Appleton, Wis.

E. C. Jacobi, Standard Oil Company (Ind.), Green Bay, Wis.

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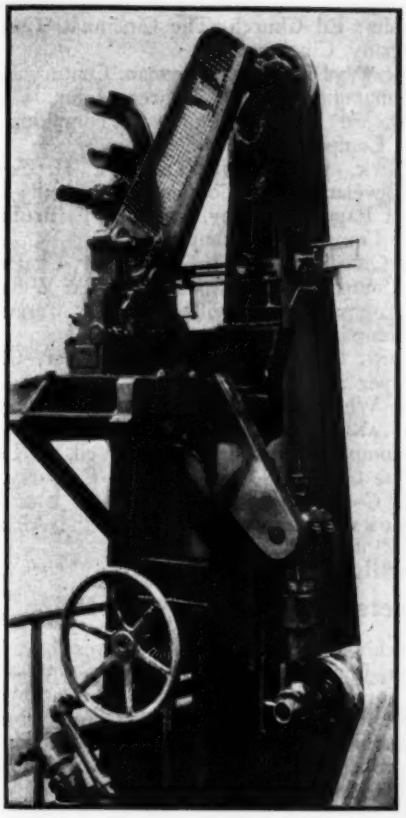

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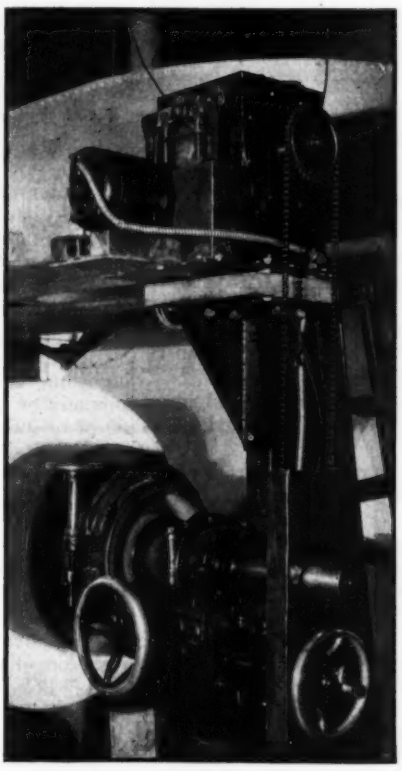

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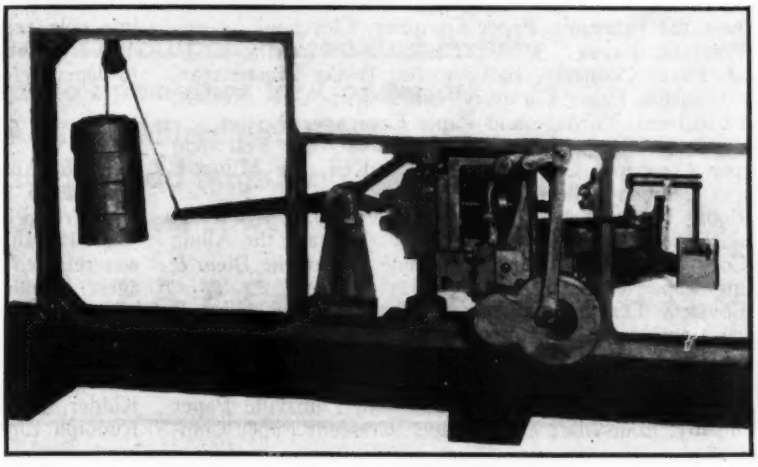

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## Paper Associations Appoint Committees

At the annual meeting of the Central States Paper Trade Association held at Columbus, Ohio, Charles H. Christiansen of the Millcraft Paper Company, Cleveland, was re-elected president of the association for the coming fiscal year. E. P. Magel of the Crescent Paper Company, Indianapolis, was re-elected vice-president, and John L. Richey re-elected secretary, treasurer and counsel.

The Middle States Wrapping Paper Association held its annual meeting at Columbus, Ohio, and elected R. W. Miller of the Central Ohio Paper Company, Columbus, as president, Gale Evans of the Cincinnati Cordage and Paper Company, Cincinnati, as vice-president, and John L. Richey as secretary, treasurer and counsel.

President Miller of the Middle States Wrapping Paper Association appointed his commodity committees for the coming year. President Christiansen of the Central States Paper Trade Association has also made appointments on his commodity committees. These appointments follow:

MIDDLE STATES' COMMITTEES

BAGS: E. P. Magel, Chairman, the Crescent Paper Company; Jack Witt, the Whitaker Paper Company; Ed Wesselmann, the Diem & Wing Paper Company.

WRAPPING PAPER: R. W. Miller, Chairman, the Central Ohio Paper Company; E. P. Magel, the Crescent Paper Company; F. C. Korte, Fisher Brothers Paper Company.

GUMMED TAPE: Dean Johnston, Chairman, Chatfield Paper Corporation; D. Z. Hegamaster, Ohio & Michigan Paper Company.

WRAPPING TISSUE: C. J. Wittrock, Chairman, the Paragon Paper Company; A. J. Ulrich, Scioto Paper Company; I. F. Kahn, Capital Paper Company.

PAPER SPECIALTIES: Gale Evans, Chairman, Cincinnati Cordage and Paper Company; George I. Tompkins, the Rowland Paper Company.

TWINE: T. Floyd Smith, Chairman, Louisville Paper Company; Al Ragor, Chatfield Paper Corporation; Don Nesbitt, Cincinnati Cordage and Paper Company.

CREDIT: Gale Evans, Chairman, Cincinnati Cordage and Paper Company; Ira D. Rohrer, John Wilding Paper Company; Fred C. Korte, Fisher Bros. Paper Company.

TRAFFIC: James Brennan, Merchants Paper Company, Inc.

MEMBER NATIONAL EXECUTIVE COMMITTEE: E. P. Magel, the Crescent Paper Company.

CENTRAL STATES' COMMITTEES

MANUFACTURERS' CONTACT: A. M. Miller, Chairman, the Central Ohio Paper Company, Columbus; Harry Petrequin, the Petrequin Paper Company, Cleveland.

WRITING PAPER: P. W. Lesh, Chairman, the C. P. Lesh Paper Company, Indianapolis; Henry Zimmerman, the Johnston Paper Company, Cincinnati; A. T. Nesbitt, the Cincinnati Cordage and Paper Company, Dayton.

OFFSET: E. A. Petrequin, Chairman, the Petrequin Paper Company, Cleveland; H. W. Keil, the Millcraft Paper Company, Cleveland.

BOOK PAPER: A. M. Miller, Chairman, the Central Ohio Paper Company, Columbus; W. J. Shaw, the Alling & Cory Company, Pittsburgh; Jerome Sturm, the Diem & Wing Paper Company, Cincinnati.

COVER & TEXT: J. E. Alcorn, Chairman, the Alling & Cory Company, Cleveland; C. R. Brown, Scioto Paper Company, Columbus; D. Z. Hegamaster, Ohio and Michigan Paper Company, Toledo.

ENVELOPE: Bruce Smith, Chairman, Louisville Paper Company, Louisville; E. P. Magel, Crescent Paper Company, Indianapolis; Ed Church, The Cincinnati Cordage and Paper Company, Cincinnati.

BLOTTING: R. W. Fleischer, Chairman, Century Paper Company, Indianapolis; Ira D. Rohrer, John Wilding Paper Company, Ft. Wayne; George I. Tompkins, the Rowland Paper Company, Louisville.

BRISTOL, BLANK, BOARD AND TAG: A. H. Seyler, Chairman, the Cleveland Paper Company, Cleveland; Dana Payne, the Daka Paper Company, Erie; H. F. Brubaker, Brubaker Paper Company, Pittsburgh.

SECONDS AND ODD LOTS: F. J. Ostermeyer, Chairman, Indiana Paper Company, Indianapolis; Warren Williams, Miller Paper Company, Louisville; W. C. Merzwiler, Miller Paper Company, Louisville.

DIRECT SELLING COMMITTEE: H. S. Frazier, Chairman, Union Paper and Twine Company, Cleveland; B. M. Johnson, the Whitaker Paper Company, Pittsburgh.

GROUNDWOOD AND NEWSPRINT: Alan Chandler, the Alling & Cory Company, Pittsburgh; Max Weil, the Union Paper and Twine Company, Cleveland; D. E. Barry, the Whitaker Paper Company, Cincinnati.

EXECUTIVE COMMITTEE: Alan Chandler, the Alling & Cory Company, Pittsburgh.

## Receivers for Reading Paper Mills

Creditors, stockholders and parties in interest have been notified that on January 10, the District Court of the United States for the Eastern District of Pennsylvania entered a decree appointing Aaron Rosen and Heber Y. Yost as receivers of the Reading Paper Mills, to take possession of its property and to collect the outstanding accounts receivable, and enjoining all creditors and other parties until further order from instituting or continuing any suits, actions or other legal proceedings against the company or levying execution upon or in anywise disposing of or intermeddling with any propertying of the Reading Paper Mills. The receivers have filed their bond, qualified and have taken possession of the company.

## The New 1936 Caslon Bond

The laboratory of the Munising Paper Company, Munising, Mich., has been making extensive experiments during the past year. A new cleaner and whiter Caslon Bond has been developed.

Caslon distributors are now offering the new 1936 Caslon Bond to their prospects and customers.

Caslon Bond now offers paper merchants a most complete line. It is made in white and 12 colors, in all weights, from substances 13 to 24, inclusive.

Caslon Bond colors in substance 24 were added to the line only recently, and are now available for immediate delivery. Substance 24 Caslon Bond colors have long been in demand for letterheads and envelopes.

## Bryant Reelects Executives

At the Annual Meeting of the Bryant Paper Company, Kalamazoo, Mich., held on February 8, all the executives and directors were re-elected.

W. B. Milham was named president and W. T. Schmitt was retained as executive vice-president and general manager. Joseph E. Brown is the vice-president, A. B. Milham, secretary and P. H. Gideon, treasurer and assistant secretary.

The board of directors includes W. B. Milham, W. T. Schmitt, Joseph E. Brown, Dr. Rudolph Gilkey, W. E. Kidder, Frank E. McAllister, Charles Clarage, Dr. S. Rudolph Light and William J. Lawrence.

# INTERNATIONAL PAPERS

## For Commercial, Publishing, and General Industrial Uses

### Printing Grades

**Bond — Book — Catalogue — Cover — Index Bristol — Ledger — Magazine Manifold — Manila — Mimeograph — Newsprint — Novel News — Colored Print — Offset — Poster — Railroad Writing — Rotogravure — Vellum**

### Converting Grades

**Adding Machine — Bag (Coffee and Candy) — Carbonizing — Coating — Cup — Drawing — Envelope — Gumming — Lace Paper — Lining — Manila Register — Sales Book — Soda Straw — Tablet — Wall Paper (raw stock) — Waxing**

## INTERNATIONAL PAPER COMPANY

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M. F. and M. G. Kraft Papers
Natural — Colored — Bleached
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## SOUTHERN KRAFT CORPORATION

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M. F. and M. G. Kraft and Sulphite Wrapping Papers
Kraft and Sulphite Specialties for Converters
M. F. and M. G. Bleached Kraft
Grocer Bags, Standard Odd Bags, Bag Specialties
Toilet, Tissues, Towels

## CONTINENTAL PAPER AND BAG CORPORATION

## Frederick James Swanson Missing

Frederick James Swanson, a student at Columbia University, disappeared from his home on Saturday, January 18, and has not been heard from since. Mr. Swanson is described as being handsome, 6 feet 2 inches tall, weighing 165 pounds, with blue eyes, brown hair and fair complexion. He wore a brown suit, white or buff-colored shirt, brown shoes, striped tie, black Chesterfield overcoat and brown fedora hat.

When last seen the young man was on his way to the Prospect Park Branch of the Young Men's Christian Association in Brooklyn, N. Y., where he was to visit a friend, Frank Kelly. His friend was not in, however, and

FREDRICK JAMES SWANSON

Mr. Swanson, after waiting briefly in the lobby, according to a desk clerk, departed and was not seen again.

In an interview with a representative of the Paper Trade Journal, his father, O. Frederick Swanson, who has been a prominent member of the pulp and paper industry for many years, said that his son had been studying extremely hard for examinations and suggested that over-application may have induced *amnesia.*

Knowing his father's long connection with the pulp and paper industry, there is a possibility that he may seek a position with a pulp and paper mill in some section of the country or an organization connected with the industry.

Any reader of the Paper Trade Journal who may come across the young man or who may be able to give any information of his whereabouts is requested to communicate at once with his father, O. F. Swanson, at his office, 21 East 40th street, New York, telephone Lexington 2-7196, who will deeply appreciate the courtesy.

## Paper Associations To Increase Activities

R. W. Miller, newly elected president of the Middle States Wrapping Paper Association, is already on the job as chief executive of that body, getting his commodity committees into active service, and working diligently to expand the membership for the purpose of increasing the influence of the organization, and in that connection met with a number of the Wrapping Paper merchants in Cleveland on Tuesday, February 11, and in Toledo on Wednesday, the 12, where the membership of the Buckeye Paper Company and Toledo Merchandise Company were added to the Middle States Association.

President Miller expects to double the membership of the organization during the coming year, in addition to broadening its activities both through the secretary's office and in conjunction with meetings. For the latter purpose he is personally offering two $25 cash prizes—one to the member of the Middle States Association who offers the best constructive practical program for Middle States Wrapping Paper Association activities during the coming fiscal year, beginning March 1, 1936, and the other prize of $25 cash to the Middle States member offering the best suggestion for getting a high percentage of members to attend the quarterly meetings. At the rate he is going, he will make the Middle States Association an even greater factor of influence and service than it has been in the past.

Due to the inability of Henry Whitaker of the Whitaker Paper Company to serve as chairman of the Ground Wood and Newsprint Committee of the Central States Paper Trade Association, Charles H. Christiansen, president of the Association, has named Alan Chandler of the Alling & Cory Company, Pittsburgh, as chairman instead, with Max Weil of Union Paper and Twine Company, Cleveland, as one member of the committee and D. E. Barry of the Whitaker Paper Company, Cincinnati, in charge of the Newsprint operations of that company as the third member of the committee.

## Consolidated Moves Offices To Chicago

General sales headquarters of the Consolidated Water Power and Paper Company, owners of four paper mills in Wisconsin at Appleton, Stevens Point, Biron and Wisconsin Rapids, have been moved from the general offices at Wisconsin Rapids to Chicago, effective February 15. Although the Consolidated company has maintained a selling office in Chicago for some time under the direction of Earl Hill, the sales headquarters and principal work were done out of the Wisconsin Rapids office.

Walter L. Mead, vice-president and general sales manager, moved to Chicago last week to become a permanent resident of that city, and to concentrate in Chicago all sales matters for his company.

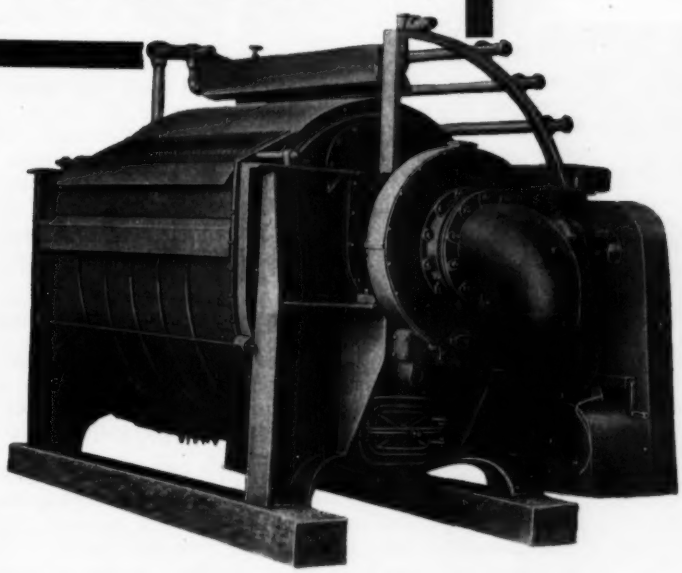
Heretofore, the Chicago office has been in the LaSalle-Wacker Building, but under the change the headquarters will hereafter be in the new Field Building, 135 South LaSalle street, where a large suite of offices has been fitted up on the 27th floor.

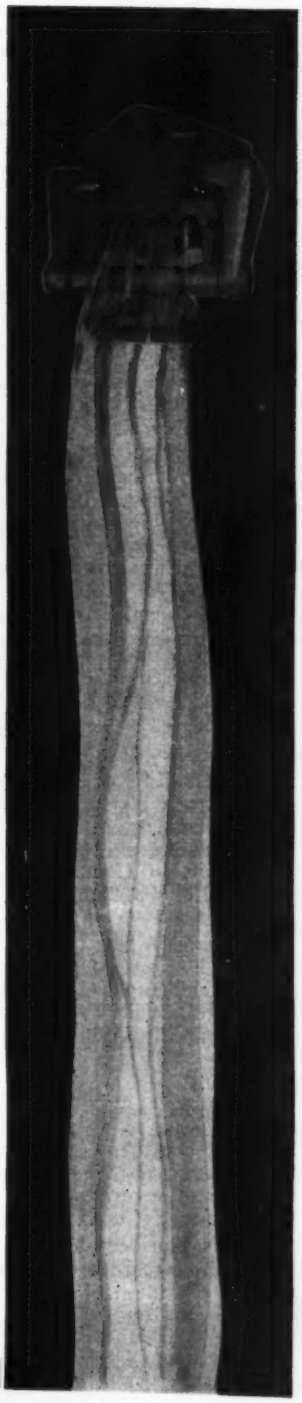
This transfer has been made necessary by the rapidly increasing selling organization the Consolidated has built up throughout the country during the last year. Paper jobbers and wholesalers stocking one or more Consolidated brands are now located in all Eastern cities like Boston, New York, Philadelphia, and throughout all of the Central States, the Middle West, and as far West as the cities of Portland, Seattle, San Francisco, Los Angeles on the Pacific Coast, and throughout the South as far as San Antonio and Jacksonville, Fla. In New York alone, fifteen representative paper wholesalers are stocking Consolidated products at the present time.

Directly under Mr. Mead, general sales manager, at the Chicago office will be: Paul Smith, in charge of Eastern wholesalers; Fred Pandow, in charge of Western wholesalers; Earl Hill, in charge of accounts in the Middle West; George C. Schneider, in charge of converting papers; M. W. Fieweger, in charge of rotogravure papers; R. M. Crutcher, in charge of magazines, and an office organization in charge of all details on sales matters.

# THIS *Sure Is* WASHING EFFICIENCY

**An Oliver-Young Bleach Washer for months averages 99 6/10% removal of chlorine from bleached stock. Results have been so consistently good that control tests on washing have been discontinued.**





THERE, in a nutshell, is the reason why a well-known paper company has just placed its third order for the Oliver-Young Filter. The first unit, installed last spring, maintained from the start excellent washing efficiency; a second unit is about to go on the line. Now, the third washer has been ordered—a rubber-covered unit.

The Oliver-Young Filter is a free-flow machine. The water passes quickly through the wire cloth, the unique valve, into the drum and out through the barometric leg. Washing efficiency, such as above, is high. Minimum water is used. This free flow also provides exceptionally high capacities in deckering and thickening.

In about a year and a half twenty-four Oliver-Young Filters have been installed. Each is giving excellent results. If you are washing or deckering free, chemical pulps in your mill, write for full details for using this proved cost-reducing filter.

OLIVER UNITED FILTERS INC.

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221 North La Salle St., CHICAGO, ILL.

351 California Street, SAN FRANCISCO, CAL.

# Obituary

### James G. Ramsey Dead

James Garfield Ramsey, aged 56 years, for the past three years superintendent of the Everett Pulp and Paper Company, died at his home, Lowell, Wash., after a brief illness, on Thursday of last week.

Mr. Ramsey was born in Pennsylvania. He received his early training in a machine shop of the Allen Wood, Iron and Steel Company, of Conshohocken, Pa., where he was taught, among other things, the correct way to turn rolls. From there he went to W. C. Hamilton & Sons Company, of Miquon, Pa., and was in their service for a period of sixteen years. It was at Miquon that Mr. Ramsey gained the fundamentals of paper making.

The Hampton Paper Company, Loudville, Mass., next claimed his services, as superintendent for A. P. Ramage of that concern. From there he went to the Chemical Paper Company, Holyoke, Mass., as superintendent. He was also superintendent and general manager for Dill and Collins.

Mr. Ramsey also holds to his credit a term of service as superintendent and manager of Jessup & Moore Paper Company, Wilmington, Del., and production manager of the Cherry River Mill, Richwood, W. Va.

Mr. Ramsey has always been active in the affairs of the American Pulp and Paper Mill Superintendents' Association, having directed the affairs of that association as president for the year 1930, and was also active in the Technical Association of the Pulp and Paper Industry, especially the branch formed recently on the Pacific Coast.

Mr. Ramsey had been superintendent of the Everett Pulp and Paper Company of Everett, Wash., for the last three years.

He is survived by his widow, Cora E. Ramsey; three sons, James G. Ramsey, Jr., Marshall W. Ramsey and Clair S. Ramsey, all of whom are married and reside at Lowell, Wash.; also three brothers, David and Thomas Ramsey, residing at Spring Mill, Pa., Robert Ramsey, residing at Conshohocken, Pa., and three sisters, Mrs. Mary Irvin, of Coin, Iowa; Mrs. Eliza J. Hastings, of Spring Mill, Pa., and Mrs. Sallie Harkins, of Norristown, Pa.

Mr. Ramsey had membership in Roxborough Lodge, No. 135, F. & A. M.; Scottish Rite Philadelphia Consistory; LuLu Temple A. A. N. O. M. S.; Roxborough Lodge No. 66 I. O. O. F.; Washita Tribe No. 53, Imperial Order of Redmen, all of Philadelphia, Pa.

### Archie J. Kennedy Dead

Glens Falls, N. Y., February 17, 1936.—Archie J. Kennedy, president of the Sandy Hill Iron and Brass Works for many years, died Saturday morning after an illness of several weeks.

Mr. Kennedy, who came to Hudson Falls from Victory Mills, had been associated with the Iron and Brass Works since October of 1907 and had served continuously as president since August of 1919.

Before coming to Hudson Falls, Mr. Kennedy was associated with the Baker & Shelvin Company of Saratoga Springs, being employed at the Schuylerville plant of the corporation for a number of years and at one time being associated with the United Paperboard company at Thomson.

Mr. Kennedy was a member of Sandy Hill chapter, 189, R. A. M., Sandy Hill lodge, 372, F. and A. M. and Calvary Commandery, 69, Knights Templar. At one time he served as high priest of Schuylerville chapter, R. A. M.

The surviving relatives are his wife, a daughter, Mrs. Chester Hunziker of Scotia; a brother, Frank C. Kennedy, of Hudson Falls and a sister, Miss Mary S. Kennedy of Saratoga Springs.

The funeral services were conducted Tuesday morning at 10:30 o'clock with the Rev. William W. Lockwood officiating assisted by the Rev. Nelson K. Crossman.

The remains were taken to the receiving vault in Prospect Hill cemetery, Schuylerville.

### Harrison R. Lewis Dead

BOSTON, Mass., February 18, 1936.—Harrison R. Lewis, aged 48, general superintendent of the paper mill of the Hollingsworth & Vose Co. at West Groton, Mass., for twelve years, died suddenly yesterday at his residence on School street, Groton.

Formerly connected with the same company at East Walpole, Mass., he came to Groton twelve years ago. Mr. Lewis was a native of Cleveland, where he conducted business under his own name for years.

Survivors include his wife, Mrs. Florence Lewis; three children, Harrison R., Jr., of Groton; Mrs. Philip Torrey, of Waltham, and John Lewis, a student at Lawrence Academy, and a sister, Mrs. W. R. MacNeill, of Montreal.

## French Paper Industry Continues Depressed

Little change in the adverse conditions at present existing in the French paper industry is looked for in the immediate future, according to a report from Consul B. M. Hulley, Nantes, made public by the Department of Commerce.

The past year proved a most unsatisfactory period for this industry, it is pointed out. The depression in other French industries and the general belief that this will continue for a long time has reacted on the paper industry, purchases being confined to bare necessities. The mills it is reported, continued to operate without profit and a great many were on part time schedules with several stated to be on the verge of voluntary liquidation.

Imports of wood pulp into France in the first 11 months of 1935, the report shows, amounted to 435,522 metric tons, a decrease of 8 per cent compared with the corresponding 1934 total. The decline was registered chiefly in wet mechanical pulp, other kinds showing remarkable steadiness. The chief sources of supply were Sweden, Finland, Germany and Norway. Only 3,986 tons originated in the United States with 7,965 tons coming from Canada.

French imports of newsprint, kraft and fine paper declined appreciably in 1935 compared with the preceding year, statistics show.

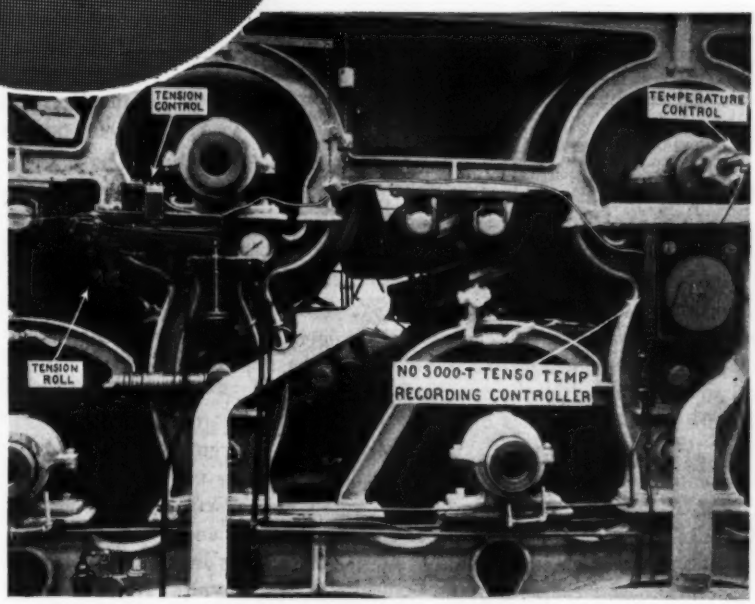
## Nekoosa-Edwards Promotes N. E. Nash

N. E. Nash has been made assistant general sales manager of the Nekoosa-Edwards Paper Company succeeding A. C. Remley, who recently became general sales manager.

Mr. Nash will continue to reside in Chicago and have charge of the Chicago sales office. His new duties will, however, necessitate a portion of his time being spent in the executive sales office at Port Edwards.

Mr. Nash, who has for some time had charge of all wrapping paper sales out of the Chicago office, will now have general charge of all wrapping paper sales—as sales manager of the wrapping paper division.

# For Better Paper Drying Use Tenso-Temp Control




Tenso-Temp control operates like a standard temperature control system without its bulb inside a drier roll and its control valve in the drier steam header—until a change in moisture content alters the tension of the sheet. Then the tension control unit takes charge and *resets* the control temperature automatically. After the reset the control is transferred to the temperature unit and over-control is anticipated.

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The Tenso-Temp detects any change in the *basic weight of the sheet, atmospheric conditions, stock density or freeness in the heat content of supply steam* and automatically resets the dryer temperature several minutes before the operator could see or feel a change in sheet condition.

Full or semi-automatic break control may be incorporated in the system.

You can install Tenso-Temp Control in your plant economically. It will repay you in more uniform paper. Write today for Bulletin P. D.—1. No obligations.

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ESTABLISHED 1872
15 West 47th St., New York, N. Y.
Henry J. Berger
Editor
Ronald G. Macdonald
Editor Technical Section
Herbert J. Laughton
Associate Editor
Thomas J. Burke, C. A.
Editor Cost Section
Lynne M. Lamm
Washington Correspondent
Price, Per Copy, 10 Cents
United States, Per Annum, $4.00
Canada, $7.50; after Jan. 1, 1936, $6.00. Foreign Countries in Postal Union, $6.00
Member Audit Bureau of Circulations
Vol. CII New York, February 20, 1936 No. 8

## THE YEAR IN PAPER

In accordance with a time-honored custom, a concise analysis of the paper industry in North America for the past year is hereby presented in this Annual Review Section of the Convention Number of the PAPER TRADE JOURNAL. The various divisions of the paper industry have been ably reviewed by representative leaders in their particular fields and the information derived therefrom may be depended upon to be thoroughly accurate and trustworthy.

Production of all grades of paper in the United States during 1935 amounted to 10,307,000 tons, or 74 per cent. of capacity, compared with 9,186,598 tons in 1934, or 66 per cent of capacity. Incidentally, the United States Census places the capacity of all paper machines at the end of 1934 at 13,888,310 tons. With four new machines installed in 1935 an estimate of the capacity at the end of 1935 is 13,899,000 tons. These figures do not include machines in mills which are completely shut down.

The remarkable recovery of the newsprint paper industry in 1934 was not only maintained during the year 1935 but was exceeded. Canadian production passed all previous records, even that of 1929, the output for the last named year being surpassed by 24,489 tons. Although the price situation continues unsatisfactory there is no doubt that the industry is gradually working itself into a better condition and it is predicted, in the long run, that all newsprint manufacturers will be able to obtain a fair price for their output.

The volume of fine paper production followed the general trend of business closely during the past year. Writing paper production increased from 417,859 tons in 1934 to 480,500 in 1935, a gain of 15 per cent. This tonnage is still below the 1929 peak output of 607,590 tons. Production, as compared with the practical capacity of the industry, was 68 per cent in 1935, compared with 59 per cent in 1934. For 1929, the industry, with a somewhat smaller capacity, was operating at 91 per cent.

The improved business conditions of 1935 were most encouraging to the book paper industry, which continued to show an improvement over 1934, which in turn was an improvement over 1933. The total production of book paper for the year amounted to approximately 1,125,000 tons, or about 67 per cent of the normal average output when the mills were operating on a normal 100 per cent basis. During the latter part of the year operations improved to approximately 72 per cent of capacity. No new machines were installed in 1935.

Heavy demands were made upon the coarse paper industry during the past year, due to the greater volume of trade transacted. Activities of the coarse paper mills rose rapidly during the last six months of the year. In some grades new monthly records were established. The volume of shipments of kraft wrapping paper exceeded slightly the greatest volume heretofore recorded in any one year. No radical price changes transpired and apart from some slight weakening in the early Summer months, quotations remained generally firm.

Demand for the various grades of paperboard during the past year not only exceeded the usual seasonal trend, but was beyond all forecasts for the period. This increase ran to such a volume that it brought the year's total close to the all time high record. During the first part of the year with the Paperboard Code in effect, participation in the National Paperboard Association included over 94 per cent of the industry. With the termination of the NRA it was anticipated that some would withdraw, since responsibility to the Code Authority had ceased. It is interesting to note, however, that participation in the statistical exchange of the association has been, and is today, in excess of 94 per cent.

During 1935, the pulp industry experienced a substantial recovery from the 1932 low point of the depression and appears to be making still further progress. The year recently ended will be long-remembered by all connected with the wood pulp industry because of its large production of all grades of chemical pulp and also because of its low quotations on mechanical wood pulp. From preliminary reports it seems likely that the year will go down in wood pulp history as a record breaker in production and consumption.

One of the most outstanding features of the year was the brisk demand for kraft pulp, the large tonnage produced, consumed and sold, not only for deliveries in 1936, but for 1937 as well. To some extent the same can be said about bleached sulphite, which has been in persistent demand since 1935 and is still gaining ground. Statistically, the chemical pulp situation has every appearance of being fairly sound, but prevailing prices are considered inadequate, in view of the reduced output and the consequent rise in manufacturing costs.

A good year for the paper and pulp industry is predicted for 1936 in the Monthly Review of the American Paper and Pulp Association. Now the industry is organized; now it has more basic information for use in determining its policies. It has a real opportunity to take advantage of the possibilities of greater volume of trade and to do so with-

out creating as it did in 1920 and in 1926, and as it was on the verge of doing in 1929, a mass of new capacity prior to its actual need. Unquestionably, the ability of the paper and pulp industry to balance its production possibilities with its consumption possibilities will be subjected to severe test. This may well define the programs of the industry's organizations for group action in 1936.

## Publishers Back Southern Newsprint Mill

CHATTANOOGA, Tenn., February 17, 1936 — James G. Stahlman, publisher of *The Nashville Banner,* reported yesterday to the directors of the Southern Newspaper Publishers' Association that definite plans were under way to manufacture newsprint in the South from Southern pine.

He said that enough contracts had been underwitten to keep a mill in operation for five years. It was pointed out, however, that the publishers would have no part in organizing or operating the plant, leaving that to private industry.

Mr. Stahlman would not predict when a plant would be built, but said that plans were being worked out to start the first one as soon as possible.

Serving with him on the newsprint committee are Clark Howell, Jr., Atlanta; E. K. Gaylord, Oklahoma City; J. L. Maples, Beaumont, Texas; Curtis B. Johnson, Charlotte, N. C.; J. R. Fishburn, Roanoke; Victor H. Hanson, Birmingham; Emanuel Levi, Louisville, and Myron G. Chambers, Knoxville.

## Book on General Forestry

A revised and enlarged "Outline of General Forestry," by J. S. Illick of the New York State College of Forestry has just been issued. It is a cloth bound book of 275 pages and is designed primarily as a general introduction to forestry and other closely related branches of conservation. It is not intended as a complete textbook, nor as a research contribution but rather as a guide to a general understanding of what forestry is, how it is developing, etc.

There is a section devoted to the various uses of wood. In recent years, forestry has progressed so rapidly that the few general textbooks are now out of date. This need prompted the preparation of this book. An unusually large number of references are listed.

Copies are obtainable at $1.50 per copy from the Book Department of the Technical Association of the Pulp and Paper Industry, 122 East 42nd street, New York.

## Ship Paper Machinery by Air Express

Although a $500 air express bill was run up. speedy air transportation of a piece of heavy machinery from Chicago recently voided the possibility of a shut-down of the paper plant of Pacific Mills Limited at Ocean Falls, B. C.

A telephone call was put through to the manufacturer in Chicago by the Vancouver office of the paper company for the replacement. It was put aboard United Air Lines, westbound plane at Chicago at 9 P.M., reaching Vancouver 19 hours later. It was transshipped for Ocean Falls the next day via SS. "Cardena," and reached the plant approximately two days later.

The replacement part weighed 643 pounds. The regular plane for Vancouver from the south was held up at Portland for a couple of hours to permit the delayed westbound plane to make connections.

## Production Ratio Report

These reports are based upon paper production reports to the American Paper and Pulp Association:

COMPARATIVE MONTHLY SUMMARIES

| 1935 | Total Production Ratio | 1934 | Total Production Ratio |
|---|---|---|---|
| January | 65.8% | January | ..... |
| February | 70.0% | February | ..... |
| March | 70.5% | March | ..... |
| April | 70.0% | April | ..... |
| May | 69.4% | May | ..... |
| June | 72.3% | June | ..... |
| July (b) | 67.8% | July | ..... |
| August | 70.9% | August | ..... |
| September (c) | 75.0% | September (c) | 59.4% |
| October | 75.6% | October | 64.7% |
| November | 75.3% | November | 61.7% |
| December (a) | 74.3% | December (a) | 62.1% |
| YEAR, 1935 | 71.2% | | |

COMPARATIVE WEEKLY SUMMARIES

| CURRENT WEEKS, 1936 | | CORRESPONDING WEEKS, 1935 | |
|---|---|---|---|
| *January 4 | 72.5% | January 5 | 60.2% |
| *January 11 | 75.8% | January 12 | 65.1% |
| *January 18 | 77.1% | January 19 | 67.0% |
| *January 25 | 76.7% | January 26 | 68.6% |
| *February 1 | 79.2% | February 2 | 68.1% |
| *February 8 | 75.8% | February 9 | 69.5% |

The following statistics show the number of mills reporting by ratio groups:

| | Number of Mills Reporting, Current Weeks | | | | | |
|---|---|---|---|---|---|---|
| Ratio Limits | Jan. 4, 1936 | Jan. 11, 1936 | Jan. 18, 1936 | Jan. 25, 1936 | Feb. 1, 1936 | Feb. 8, 1936 |
| 0% to 50% | 143 | 88 | 86 | 93 | 83 | 57 |
| 51% to 100% | 199 | 253 | 256 | 244 | 244 | 175 |
| Total Mills Reporting | 342 | 341 | 342 | 337 | 327 | 232 |

* Subject to revision until all reports are received. These data exclude (a)—Christmas Day, (b)—Fourth of July, (c)—Labor Day.

PAPERBOARD OPERATING RATIOS

According to reports from the National Paperboard Association, per cents of operation, based on "Inch-Hours", were as follows:

| 1934 | | 1935 | | 1935 | | 1935 | |
|---|---|---|---|---|---|---|---|
| September | 62% | January | 61% | May | 61% | September | 69% |
| October | 63% | February | 67% | June | 65% | October | 76% |
| November | 56% | March | 67% | July | 59% | November | 70% |
| Dec. (a) | 53% | April | 61% | August | 65% | December | 60% |

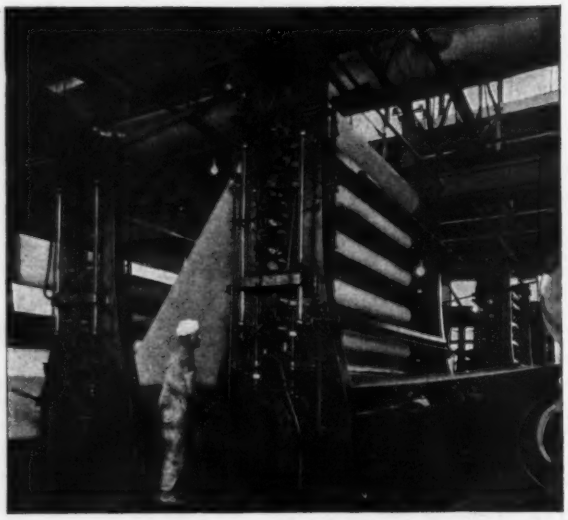
Week ending Jan. 4, 1936.... 51%
Week ending Jan. 11, 1936.... 65%
Week ending Jan. 18, 1936.... 61%
Week ending Jan. 25, 1936.... 64%
Week ending Feb. 1, 1936.... 63%
Week ending Feb. 8, 1936.... 66%

## To Hold Wood Uses Conference

National attention to be drawn to the possibilities of Southern forests is the purpose of a Wood Uses Conference which has been organized by the Forestry Committee of the Beaumont, Texas, Chamber of Commerce. The conference will be held March 6 and 7. Officials of the United States Forest Service and of the various forest services of Southern States will participate in the program. Dr. Charles H. Herty, of Savannah, Georgia, will discuss cellulose production from Southern pines. Among other subjects to be discussed are: the pulp industry in the South, forest conservation, wood preservation and the recently completed forest surveys in the South by the United States Forest Service.

## New Sulphate Mill For Finland

The project for a new sulphate mill to be erected near Oulu, Finland, seems likely to be carried out, according to a recent report from E. I. Kapy, office of the American Consulate General in Helsingfors. The construction of the mill, which will have an initial capacity of 80,000 to 100,000 metric tons, has been intrusted to Kero Kalaja, the designer of the new sulphate mills at Enso and Kaukopaa. The new mill will utilize saw mill waste and pine wood, hitherto used for firewood in the production of wood pulp.



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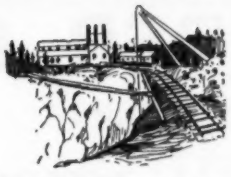

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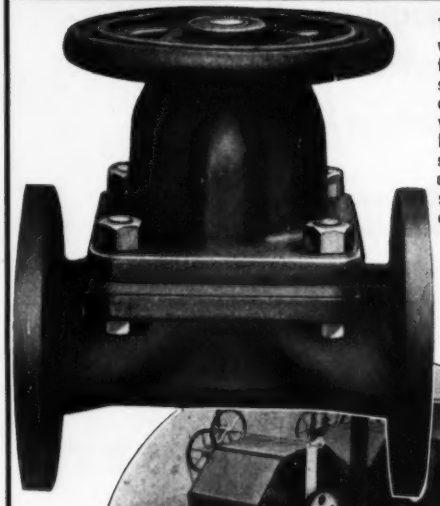
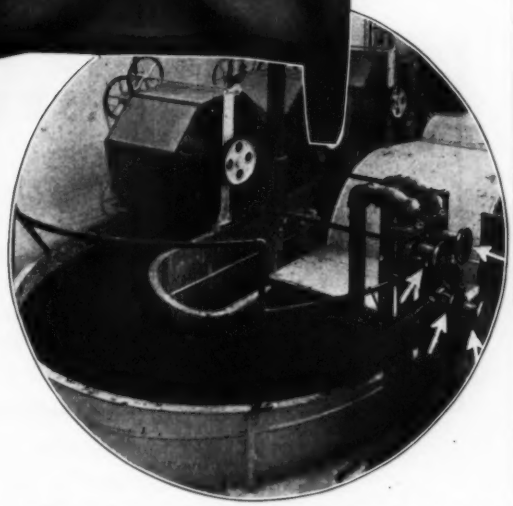


The design of this valve is a departure from ordinary design. It is free operating with all working parts isolated from substances handled, eliminating any possibility of jamming or sticking.



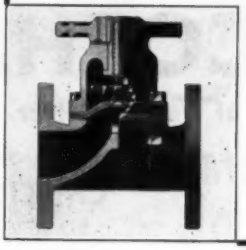


PHOTO SHOWS HILLS-McCANNA SAUNDERS PATENT VALVES HANDLING PULP IN A PROMINENT PAPER MILL.

***Literature and Prices upon request.***

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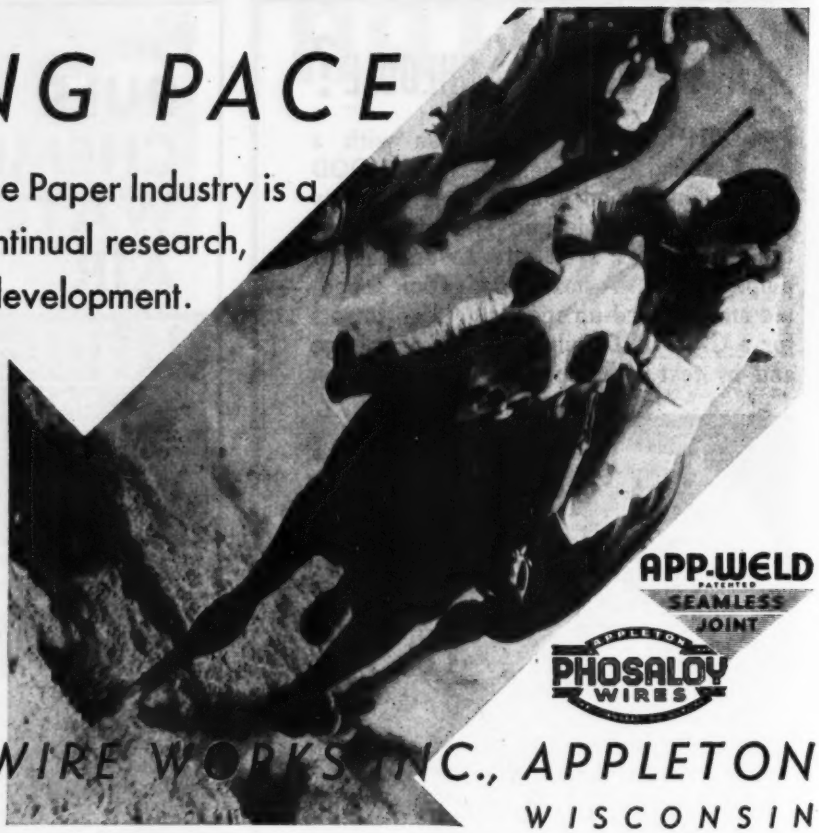


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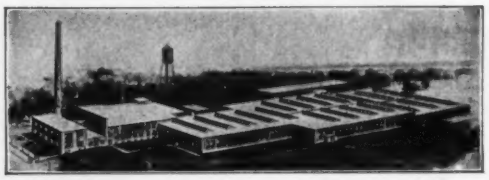

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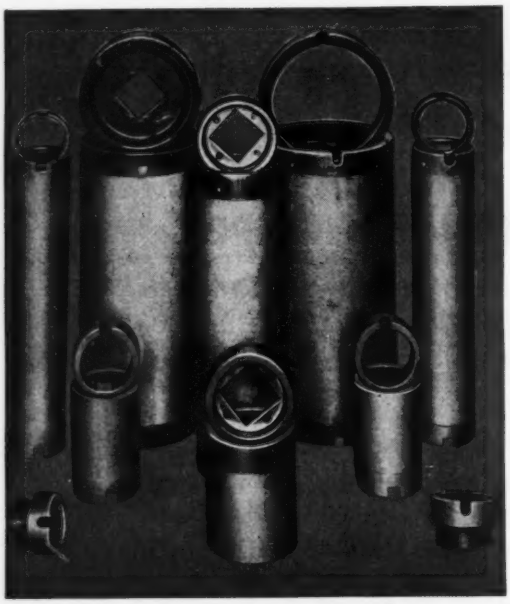

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Straight wound paper cores made in sizes from 2" to 10" inside diameter with any thickness wall required.

Long draw protected slot caps of heavy gauge steel in all standard sizes.

Heavy duty caps with reenforced square hole. This new patented feature of reenforcement gives added strength and durability.

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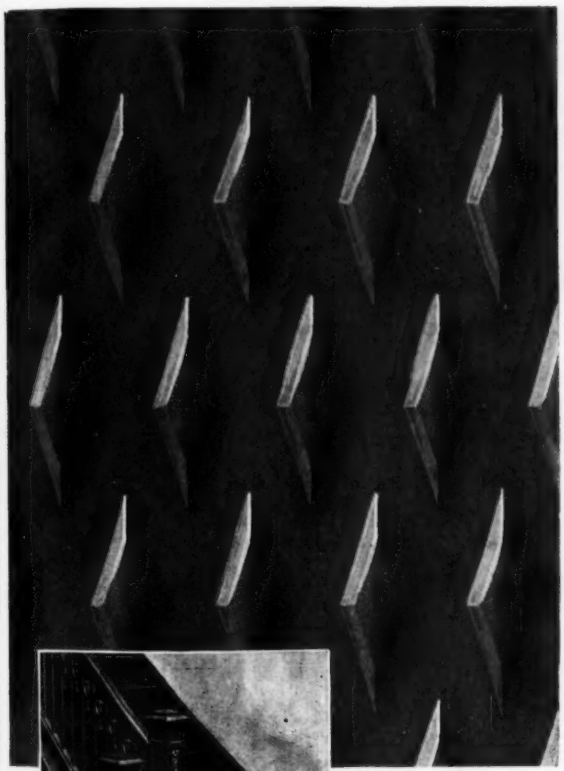
ROLLED STEEL FLOOR PLATE
*prevents slippage of foot or wheel*



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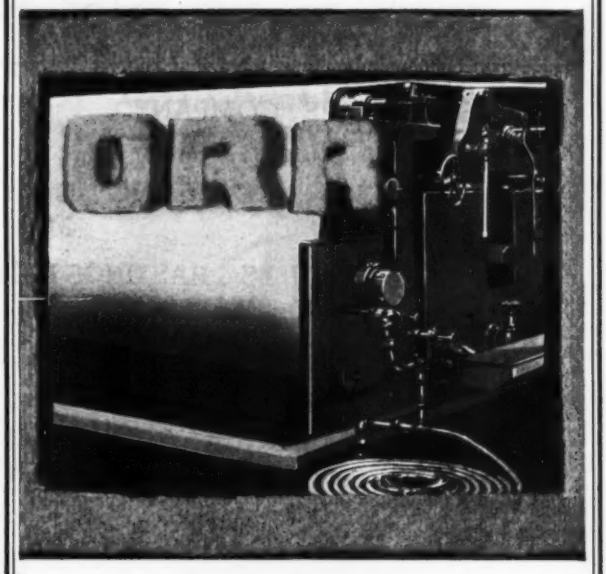
NASHUA GUMMED & COATED PAPER COMPANY

Nashua, New Hampshire

*Mills at*

Nashua, New Hampshire Peterboro, Ontario, Canada




## Clipping the Corners Off the Felt Bill

It is rather significant that recent tests should show Orr Felts outlasting felts with which they were compared—outlasting them, not by hours, but by as much as several days.

Figured over a year's operation, such a difference in durability takes on deep significance—points the way for those interested in curtailing expense wherever it can be sensibly done.

Clipping the corners off felt bills by adopting the particular felt that will deliver the greatest service is well worth the consideration of any mill—and is now receiving that consideration in many of them.

*Orr Felts are built to remove water faster and serve longer. They are available in any texture and any size you may require.*

**A complete line—an Orr for every machine requirement.**

**The Orr Felt and Blanket Company**

**Piqua, Ohio**

ORR FELTS

A SERVICE TO THE TRADE THAT WAS ESTABLISHED IN 1855

HUBBS & HOWE COMPANY
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PAPER — TWINE — PAPER PRODUCTS

# PAPER MAKING MACHINERY

**Fourdrinier Paper Machines**
Quick changing wire features

**Cylinder Paper Machines** for all grades of board

**Bevel Gear Drive Stands** with Ball Bearings and M & W High Speed Friction Clutch

**Brass Collapsible Winder Shafts**
Non-sticking; quick-changing

**"Criss Cross" Shower Pipes**
High efficiency with low water consumption

**Millboard Machines** improved design
For asbestos gaskets also cement siding

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Two-Drum type for small rolls
Four-Drum type; electric or belt drive
Two-Drum and Four-Drum Supercalender Winders

**High Density Bleaching Process**
Wolf, Bellmer, Fletcher

**Pumps:** Stuff; Suction; Centrifugal

**Reels**
With 2, 3, 5 or 6 drums; Upright and Revolving types

**Rotary Screens**
Clean paper with minimum maintenance

**Save-Alls**
Economical, efficient closed system

**Single and Duplex Cutters**
High speeds—all widths—all kinds of paper

**Single and Duplex Lay Boys**
Increase cutter output; reduce finishing room costs

**Slitter Parts**
New ball bearing type, with removable Slitters, saves slitter tears

**Wire and Felt Guides**
Ball and plain bearing types for all speeds

**Wood Suction Box Covers**
Save wear of the Fourdrinier wires

**M & W Friction Clutches and Speed Changes**

INFORMATION AND BULLETINS ON REQUEST

The MOORE & WHITE Co.
PHILADELPHIA, PA.
N. PHILA. STA. PENNA. R.R.
PAPER MILL MACHINERY

"To get more out of printed matter
—PUT MORE INTO IT"
*Martin Cantine*

•

# Cantine's
## COATED PAPERS

### GLOSSY COATED BOOKS

**Hi-Arts:** Double coated, extra high finish.
**Ashokan:** Cantine's fine coated book.
**Markote:** Innermarked to prevent substitution.
**Esopus Tints:** In nine pastel shades.
**Zena:** Cantine's medium priced coated.
**Catskill:** For those who must have the lowest possible cost.

### FOLDING OR COVER

**Colorfold:** Cantine's colored folding semi-dull coated for covers and mail pieces. Made in six pastel shades.
**Canfold:** Cantine's highest achievement in folding coated.
**M-C Folding:** A good practical folding stock with excellent coated surface.
**Postcard:** For mailing cards, menus, etc., printed in halftone on one or both sides.

### NON GLOSSY

**Velvetone:** Cantine's best semi-dull coated.
**Softone:** An unusually fine semi-dull coated.

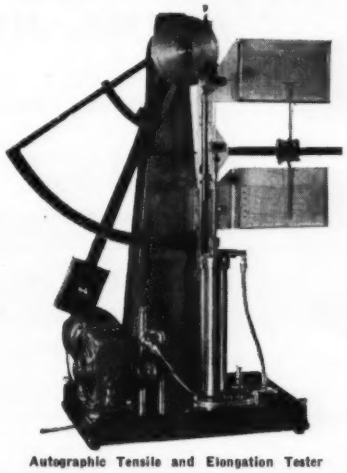
### COATED ONE SIDE

**Duo-Bond:** Unexcelled for illustrated letters.
**Lithogloss:** A fine coated stock for lithography. Suitable for varnish.
**Zena Litho:** Medium priced coated one side.
**Catskill Litho:** Cantine's lowest priced coated one side.

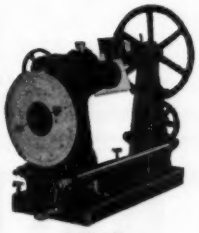
**THE MARTIN CANTINE COMPANY**
**Specialists in Coated Paper Since 1888**
**SAUGERTIES, NEW YORK**



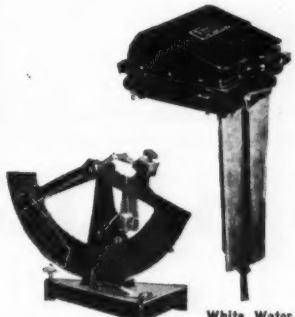
# THWING PAPER TESTING INSTRUMENTS



Autographic Tensile and Elongation Tester

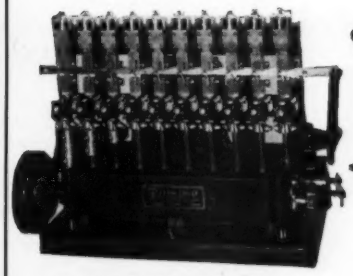


Initial Tear Tester



White Water Sampler

Elmendorf Tearing Tester



Multiple Folding Endurance Tester

Basis Weight Scale

Thwing Paper Testing Instruments are sensitive and accurate for testing all grades of paper and paper products. They provide the definite technical information for the paper industry to establish standards of quality.

438

**THWING-ALBERT INSTRUMENT CO.**
**3341 Lancaster Avenue, Philadelphia, U. S. A.**

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FOUNDED IN 1846

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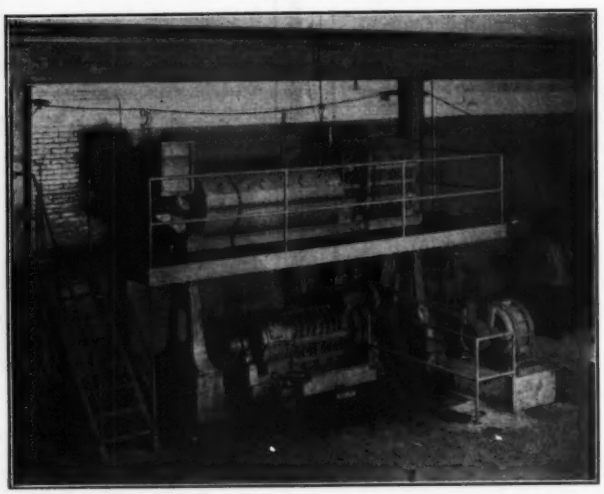

For pulping
Screen Tailings,
Bull Screen and
Knotter Waste—
From Groundwood,
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Sulphate Mills

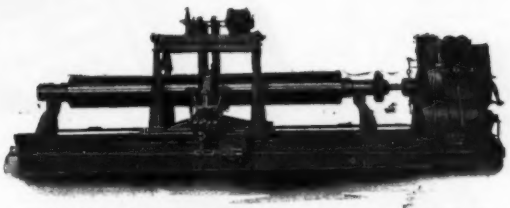
**ANTON J. HAUG**—Builders of Pulp Mill Machinery
Nashua, N. H.—U. S. A.

*— Also built in Canada and Europe —*

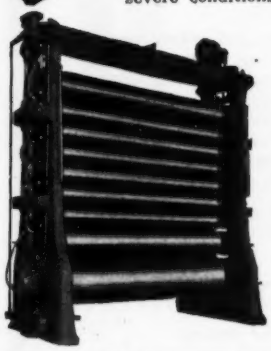
for QUALITY PRODUCTION

Lobdell "Puraloy" Chilled Calender Rolls assure maximum hardness and a perfect surface. They minimize pitting and wear, and are therefore ideal for the very severe conditions of water finish papers.

Lobdell Improved Micrometer Roll Caliper—an indispensable, absolutely accurate instrument for all mills—either to keep a check on regrinding, or on the condition of Calender and Press Rolls.



The Lobdell Roll Grinding Machine—Possesses two exclusive Lobdell Features: (1) The automatic Crowning Device which produces the exact predetermined Roll Crown, by simple setting of a micrometer scale. (2) Provision for leveling the bed (to compensate for wear).



Lobdell Calender Stacks are accurate, durable, easily operated machines. Rolls are of "Puraloy" and stacks may be equipped to operate with either Electric Motor, Hydraulic or Ratchet Lift-all controlled from the floor. Modern, trouble-free lubrication is another feature, of these widely used and endorsed Calender Stacks.

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CHAMPION-INTERNATIONAL COMPANY
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In 1930 reduce your roll replacement costs!

NO WONDER THEY LAST LONGER
SURE—ITS MADE FROM PRE-CONDITIONED PAPER
PERFECTLY PROPORTIONED HERE!
THIS SURFACE IS DIAMOND FINISHED

WALDRON *Long Life* PAPER ROLLS

Get more service hours from your rolls and reduce your roll costs this year. Waldron Rolls are built to last longer. Made of special conditioned paper, of a grade for each operating condition and correctly compressed, on high carbon oversized shafts, their diamond finished surface produces finer embossing with minimum replacement expense. Compare them on a "cost per service hour" basis with any other roll on the market.

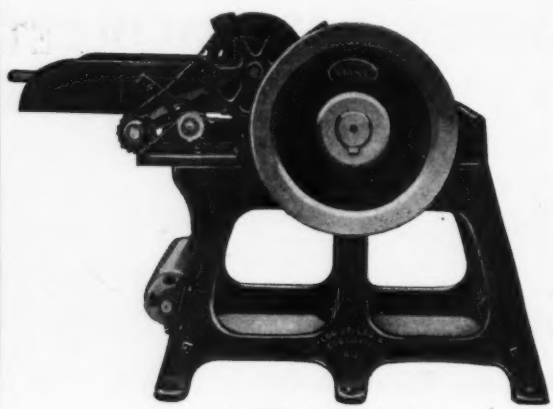
[FREE! Valuable Instruction Sheet on "How To Run In A Paper Roll." Write for a copy!]

JOHN WALDRON CORPORATION
New Brunswick — New Jersey

GIANT RAG CUTTERS

The standard of the world for over 60 years.

In capacities from 1,500 to 10,000 pounds per hour. Single Tandum Multiplex.

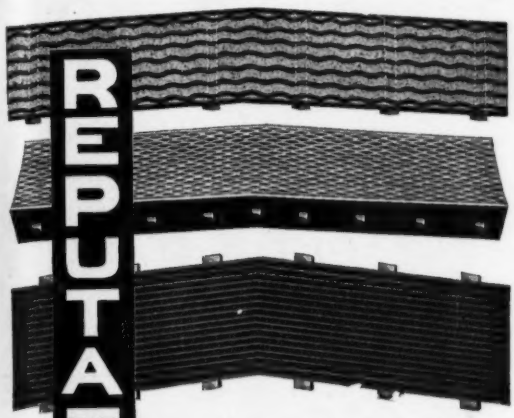


No. 1-A "Giant Cutter"

For Cutting RAGS — BURLAP — BAGGING — ROPE — JUTE BUTTS, MAGAZINES, CATALOGS & OLD PAPERS.

ROLL BARS—
BED PLATES
RAG CUTTER KNIVES

TAYLOR, STILES & COMPANY, RIEGELSVILLE, NEW JERSEY

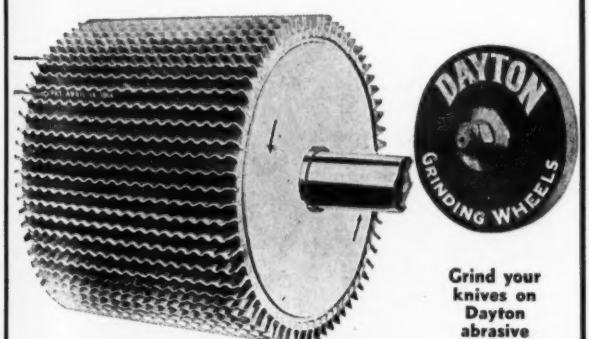



Mill superintendents who constantly strive for improvement of product and reduction of costs to the lowest possible point consistent with quality, find faithful allies in S. W. W. beater bars and bed plates—beater tackle of national reputation.

The S. W. W. line of bars include the Dowd staggered type, the Simonds-Dayton corrugated and vented types; the usual standard sections. Bars also forged to meet special requirements out of carbon alloy steels, stainless steel and bronze.

The line of bed plates includes the comparatively new abrasive-steel combination plate shown at the top of the above illustration, the diamond pattern shown in the center and the standard elbow pattern at the bottom of the cut. Also special bed plates to meet special conditions.

*Simonds-Worden-White also manufacture paper trimming knives, chipper knives, Dayton roll bar grinders and the well-known Dayton abrasive wheels.*




Grind your knives on Dayton abrasive wheels.

S. W. W. corrugated bar reproduced above. All other required bars available.

SIMONDS WORDEN WHITE CO.
OFFICE
DAYTON, OHIO
SWW SWW
Factories at DAYTON-BUFFALO-CLEVELAND-BELOIT

# Be strong and very courageous

*A message from KVP, makers of Food Protection Papers and a good grade of Bond and Writing Papers for office and school use.*

1936 - what?

Will Fear and Worry get you down? Don't let them, they are Killers! Wars and rumors of wars are their deadly weapons, political and economic uncertainties their fatal poisons.

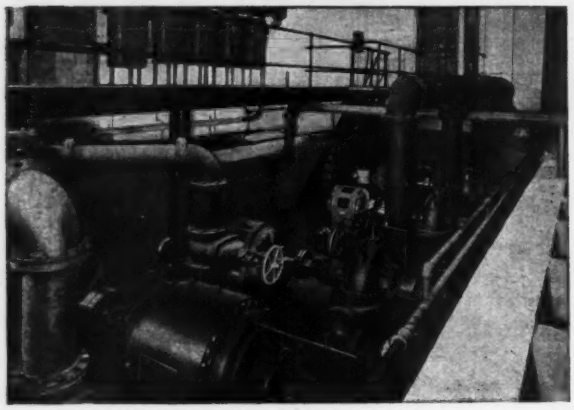
You are greater than anything that can happen to you. Faith and Courage will conquer all difficulties.

Go forward, and be strong and very courageous!

KALAMAZOO VEGETABLE PARCHMENT CO.
PARCHMENT (KALAMAZOO COUNTY) MICHIGAN

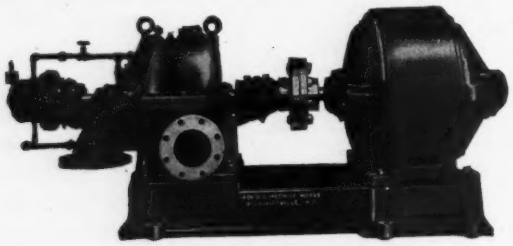
# The MORRIS HYDRAULIC COLUMN

*News of interest to Centrifugal Pump Users*



## Tabloid testimonials . . . .

"Really remarkable performance"; "not only satisfied but surprised"; "best on the market"; "entirely satisfactory in every respect"; "extremely gratifying results"—these are some of the concise comments which we continually receive from gratified users of Morris Centrifugal Pumps. Morris Pumps are built for a wide variety of pulp and paper-making processes and general plant services. Special designs include non-clogging pumps and pumps for handling chemicals, clear or white water, thin or thick stock, etc. Morris Pumps for Paper Mill services are described in bulletin 149 which will be sent on request.



## A pump investment that is paying 229% dividends annually . . . .

Decidedly worth-while economies can be obtained by modernizing even small pumping units. Here is a case in point. The six-month power bill for operating a 4-in. 2-stage centrifugal pump was $2544.39. After this unit had been replaced by a Morris Pump, the power bill for the same six-month period in the following year, with the same operating conditions, was $1994.10. The six months saving of $550.29 which resulted from the investment of $480.00 in the new Morris Pump, means that this pump pays for itself more than twice each year. Does a similar opportunity for saving exist in your plant? You can find out by asking the Morris Engineers to survey your pumping requirements and offer recommendations—without the slightest obligation on your part.

***For authoritative recommendations on any pumping problem, write to MORRIS MACHINE WORKS, Baldwinsville, N. Y.***
***Offices in Principal Cities***

**Memo from Engineering Dept.**

*This year we're going to use* ***Armco Spiral Welded Pipe*** *for all new lines and replacements. We can get it quickly; it costs less to install; its smooth interior increases flow capacity and it stands up well in paper-mill service. Send specifications to The American Rolling Mill Co. Pipe Sales Division, Middletown, Ohio.*

ARMCO

**ARMCO**
**SPIRAL WELDED PIPE**

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AGENTS

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**SMALL ROLL PRODUCTS**

**PERFECTION ROLLS are uniform, accurately slit, lintless and wound to full diameter.**

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CLOCK ROLLS

*Perfection Rolls Are Perfect in Every Detail*

**PAPER MANUFACTURERS CO., Inc.**
5th and Willow Streets Philadelphia, Pa.

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**SLIME REMOVER**

**Feltex . . .**

A new Magnus Product that cleans felts more quickly—leaving them more porous, more open. Felts last longer—vacuum pressure drops, 50% to 100% greater tonnage obtained per felt is the average performance after the adoption of MAGNUS FELTEX in a mill, with proportionate time and labor savings due to fewer shut-downs for washing and changing felts.

Write today for full details on the latest data sheets.

Made by the manufacturers of MAGNUS SLIME REMOVER and MAGNUS FELT SOAP.

**MAGNUS CHEMICAL COMPANY**
Manufacturers of Cleaning Materials
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Magnus CLEANERS

**Magnus**
**FELT SOAP**

**Tomahawk Kraft Paper Co.**

*Manufacturers of*

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**Kraft Specialties**
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Mills At
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REDUCE YOUR FOURDRINIER WIRE COSTS BY USING A WIRE THAT WILL GIVE YOU ALL AROUND SERVICE.

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A WIRE WITH A NON-CRACK PATENTED SELVIDGE

# PURVES WIRES

ARE AS GOOD AS THE BEST.

PURVES MACHINE WIRE COMPANY, INC.
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# CONVENTION WEEK

This Convention will be a great success and will enable all of us to get together and exchange views that will be profitable to the entire industry.

Our representatives will be very pleased to consult with you regarding your color problems.

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*For Flawless Surface*

IF your problem is foam, then we suggest that you investigate NOPCO 1333 Foam Killer. Nopco 1333 is an inexpensive product, easy to handle, does not fill up the wires of felts, and will not affect formation of the sheet. Write for bulletin giving complete information.

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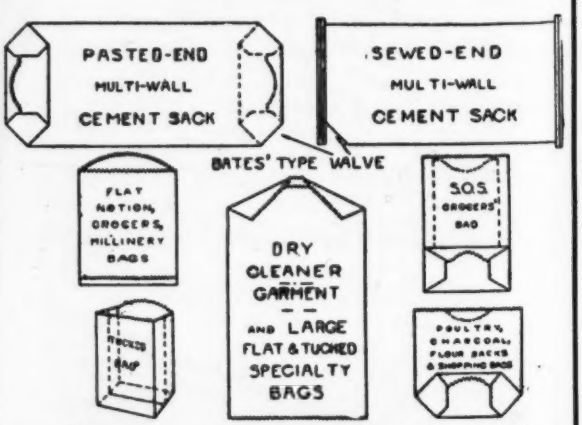
OVER 60 MODELS OF PAPER BAG

# MACHINERY

*FOR PLAIN OR PRINTED*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**Basis Weights 20's to 100's**

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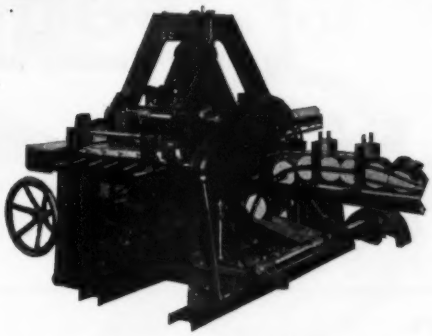
*We Invite Your Inquiries*

**Dexter Sulphite Pulp & Paper Co.**

**Dexter, N. Y.**



# 3600 TOILET ROLLS WRAPPED EVERY HOUR



**You can maintain profitable twenty-four hour production in the over-all wrapping of toilet rolls with this Cannard Wrapper. Wraps 3600 rolls an hour, twenty-four hours a day. Requires only one attendant. Write today for complete specifications. Machines of comparable design are obtainable for banding toilet rolls, wax paper rolls and tissue rolls.**

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# West Virginia Pulp and Paper Company

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**ENGLISH FINISH SUPERCALENDERED MACHINE FINISHED BOOK and LITHOGRAPHIC PAPERS**

Offset, Envelope, Bond, Writing, Mimeograph, Ledger, Cover and Music Papers, Index Bristol, Post Card and Label Papers

**High Grade Coated Book**

*also*

**KRAFT WRAPPING AND KRAFT ENVELOPE**

**Bleached Spruce Sulphite Pulp, Soda and Kraft Pulp**

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Quick Lift of Roll from Wire
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Long Life Phosphor Bronze Flange
S K F Ball Bearing Rollers

**Sinclair DOUBLE TRUSS DANDY ROLLS** Mounted in the **Sinclair Single Pedestal Stand** is the last word in an Open End Dandy Roll Application

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**HOLYOKE • MASSACHUSETTS**

FOURDRINIER WIRES • CYLINDER WIRES • DANDY ROLLS • CYLINDER MOULDS

OUR CLAYS ARE NATURAL, THEREFORE FAST COLOR

NOT ARTIFICIALLY BLUED OR BLEACHED

*Superior Quality and Service Obtains Business*

**ENGLISH** ECCO CLAYS **CLAYS**

English China Clays Sales Corporation

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All kinds and styles of Felts for all kinds and styles of Papers.

Write us about your Felt problems and let us help you reduce your Felt Costs—we will call anywhere at any time.

DRAPER BROS. COMPANY

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*Woolen manufacturers since 1856*

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The ideal metal for corrosion resistance in the

**Paper and Pulp Industry**

PROMPT SERVICE

—by the largest producers specializing in 18-8 stainless steel castings.

**The Cooper Alloy Foundry Company**

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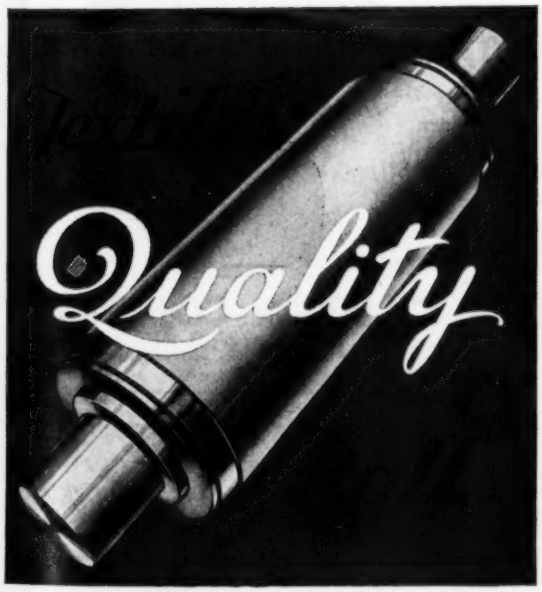


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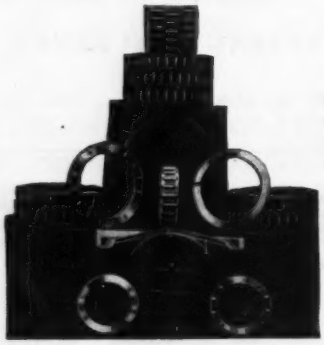

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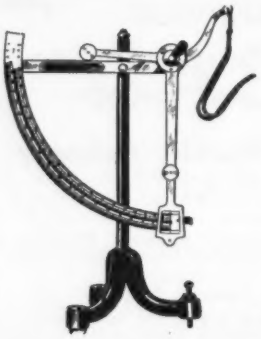

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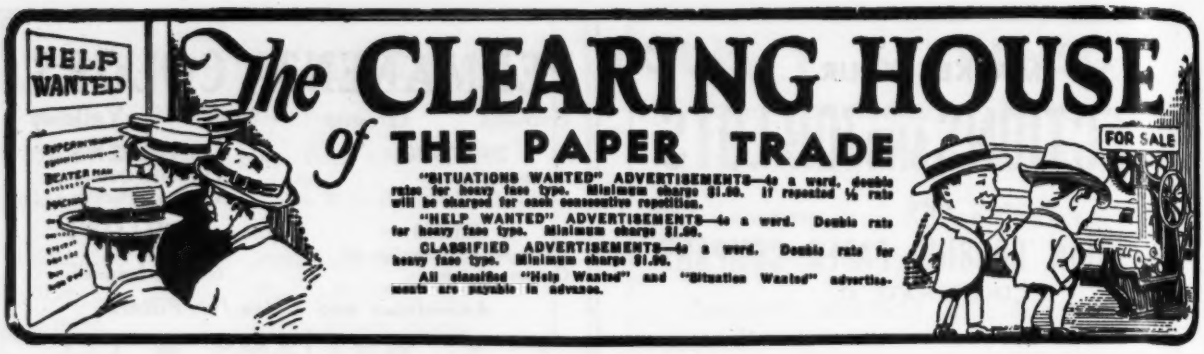
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Reply to Box 36-81 care Paper Trade Journal. M-12

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**BEARINGS, QUILL**
The Bantam Ball Bearing Co.
Hyatt Roller Bearing Co.
SKF Industries, Inc.
Timken Ball Bearing Co.

**BEARINGS, ROLLER**
The Bantam Ball Bearing Co.
Hyatt Roller Bearing Co.
SKF Industries, Inc.
Stearns-Stafford, Inc.
Timken Roller Bearing Co.

**BEARINGS, ROLLER (Self Aligning)**
The Bantam Ball Bearing Co.
Hyatt Roller Bearing Co.
Timken Roller Bearing Co.

**BEARINGS, ROLLER (Thrust)**
The Bantam Ball Bearing Co.
Hyatt Roller Bearing Co.
SKF Industries, Inc.
Timken Roller Bearing Co.

**BEARINGS, TABLE ROLLER**
The Bantam Ball Bearing Co.
Hyatt Roller Bearing Co.
SKF Industries, Inc.
Timken Roller Bearing Co.

**BEATERS**
The Appleton Machine Co.
Dilts Machine Works, Inc.
Downingtown Mfg. Co.
Improved Paper Mchy. Corp.
Noble & Wood Machine Co.
Valley Iron Works Co.

**BEATER BARS**
Noble & Wood Machine Co.

**BEATER BED PLATES**
Dilts Machine Works, Inc.
Noble & Wood Machine Co.
Taylor, Stiles & Co.
Valley Iron Works Co.

**BEATER CONTROLS**
Thwing-Albert Instrument Co.

**BEATER ENGINE BARS**
Dilts Machine Works, Inc.
Taylor Stiles & Co.
Valley Iron Works Co.

**BEATER HOODS**
Dilts Machine Works, Inc.

**BEATER ROLLS**
Dilts Machine Works, Inc.
Noble & Wood Machine Co.

**BEATER STOCK RECORDERS**
Bristol Co., The

**BELTING**
L. H. Gilmer Co.
Goodrich Rubber Co.
Goodyear Tire & Rubber Co.
The Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc.
Rhoads Sons, J. E.

**BELTING (Conveyor)**
Manhattan Rubber Mfg. Co.

**BELTING (Transmission)**
Manhattan Rubber Mfg. Co.

**BELTING (V)**
Manhattan Rubber Mfg. Co.

**BLEACH EJECTORS**
Perkins & Sons, Inc., B. F.

**BLEACHING APPARATUS**
Moore & White Co.

**BLEACHING POWDER**
Mathieson Alkali Works, Inc.
Pennsylvania Salt Co.

**BLEACHING PROCESS**
Electro Bleaching Gas Co.
Pennsylvania Salt Co.

**BLOW PIPES**
D. J. Murray Mfg. Co.

**BLOW PIPING**
Moore & White Co.

**BLOW PITS**
Kalamazoo Tank & Silo Co.

**BLOW VALVES**
D. J. Murray Mfg. Co.

**BLOWERS (Centrifugal)**
De Laval Steam Turbine Co.
Roots-Connersville Blower Corp.
Ross Engineering Corp., J. O.

**BOARD MACHINES**
Beloit Iron Works
Noble & Wood Machine Co.
Oliver United Filters, Inc.

**BOILERS**
Manufacturers Supply Co.

**BOILER PRESERVATIVES**
Magnus Chemical Co.

**BOTTOMS (Steel & Wood)**
Harrington & King Perforating Co.
Kalamazoo Tank & Silo Co.

**BRASS COLLAPSIBLE SHAFTS**
Moore & White Co., The

**BRICK, Digester**
Stebbins Engrg. & Mfg. Co.

**BUCKETS (Elevating)**
Hendrick Mfg. Co.
Jeffrey Mfg. Co.
Link-Belt Co.

**BULKERS (Pressure)**
B. F. Perkins & Son, Inc.

**BUNDLING PRESSES**
Paper Converting Machine Co., Inc.
Potdevin Machine Co.
Weber, Herman G.

**BURSTING TESTERS**
B. F. Perkins & Son Co.
Testing Machines, Inc.

**CALCIUM HYPOCHLORITE**
Mathieson Alkali Works, Inc.
Pennsylvania Salt Mfg. Co.

**CALENDERS**
Beloit Irons Works
Downingtown Mfg. Co.
Farrel-Birmingham Co.
Lobdell Car Wheel Co.
Moore & White Co.
Norwood Engrg. Co.
Perkins & Son, Inc., B. F.
Smith & Winchester Mfg. Co.

**CALENDER DOCTORS**
Bird Machine Company
Downingtown Mfg. Co.
Ticonderoga Machine Works

**CALENDER ROLL GRINDERS**
Farrell-Birmingham Co.
Lobdell Car Wheel Co.
Smith & Winchester Mfg. Co.
Ticonderoga Machine Works

**CALENDER ROLLS**
Farrel-Birmingham Co.
Lobdell Car Wheel Co.
Perkins & Son, Inc., B. F.
Smith & Winchester Mfg. Co.
Textile Finishing Machy Co.
Waldron, Corp., John

**CALIPERS (Micrometer Roll)**
Farrel-Birmingham Co.
Lobdell Car Wheel Co.

**CAMERAS (Photomicrographic)**
Bausch & Lomb Optical Co.
R. Fuess, Inc.

**CARBON BISULPHIDE**
Pennsylvania Salt Co.

**CASEIN**
American Cyanamid & Chemical Corp.
The Casein Manufacturing Co. of America
Paper Makers Chemical Corp.

**CASING**
D. J. Murray Mfg. Co.

**CASTINGS**
International Nickel Co.
Farrel-Birmingham Co.
The Frederick Iron & Steel Co.
Lobdell Car Wheel Co.
Montague Machine Co.
Smith & Winchester Mfg. Co.

**CASTINGS (Alloy)**
Michigan Steel Castings Co.

**CASTINGS (Brass, Bronze, Iron)**
Downingtown Mfg. Co.
Smith & Winchester Mfg. Co.

**CASTING (Chrome Nickel Alloy)**
Lobdell Car Wheel Co.
Cooper Alloy Foundry Co.

**CASTINGS (Iron)**
Downingtown Mfg. Co.
Hamblet Machine Co.
Jeffrey Mfg. Co.
Link-Belt Co.
The Frederick Iron & Steel Co.

**CASTINGS (Stainless Steel)**
Cooper Alloy Foundry Co.

**CAUSTIC SODA**
American Cyanamid & Chemical Corp.
Mathieson Alkali Works, Inc.
Paper Makers Chemical Corp.
Pennsylvania Salt Mfg. Co.

**CELLULOSE BAG MACHINERY**
Potdevin Machine Co.

**CEMENT**
Pennsylvania Salt Mfg. Co.
Stebbins Engrg. & Mfg. Co.

**CENTRIFUGAL MACHINERY (Special)**
De Laval Steam Turbine Co.

**CENTRIFUGALS (Paper Stock)**
Bird Machine Co.
J. E. Singer & Son

**CHAIN DRIVES**
Jeffrey Mfg. Co.
Link-Belt Co.

**CHEMICAL FEED EQUIPMENT**
Wallace & Tiernan, Co., Inc.

**CHEMICALS**
American Cyanamid & Chemical Corp.
E. I. DuPont de Nemours & Co., Inc.
Electro Bleaching Gas Co.
General Dyestuff Corp.
Geigy Co., Inc.
Gottesman & Co., Inc.
Paper Makers Chemical Corp.
Pennsylvania Salt Mfg. Co.
Solvay Sales Corp.
Williams & Co., C. K.

**CHIPPERS**
D. J. Murray Mfg. Co.
Valley Iron Works Co.

**CHIP SCREENS**
D. J. Murray Mfg. Co.

**CHLORINATING APPARATUS**
Stebbins Engrg. & Mfg. Co.

**CHLORINE**
Electro Bleaching Gas Co.
Mathieson Alkali Works, Inc.
Pennsylvania Salt Mfg. Co.

**CHLORINE CONTROL APPARATUS**
Wallace & Tiernan, Co., Inc.

**CHROME PLATE**
Chromium Corporation of America

**CHUCKS**
John Waldron Corp.

**CLAY**
American Cyanamid & Chemical Corp.
English China Clays Sales Corp.
Paper Makers Importing Co.
Vanderbilt Co., R. T.

**CLEANING MATERIALS**
Magnus Chemical Co.
Philadelphia Quartz Co.

**CLUTCHES**
Beloit Iron Works
D. J. Murray Mfg. Co.
Jeffrey Mfg. Co.
Link-Belt Co.
Moore & White Co.
T. B. Wood's Sons

**CLUTCH PULLEYS**
Moore & White Co.
T. B. Wood's Sons

**COAL & ASHES HANDLING MACHINERY**
Jeffrey Mfg. Co.

**COATING MACHINERY**
Moore & White Co.
Potdevin Machine Co.
Waldron Corporation, John
Weber, Herman G.

**COATING MATERIALS**
Paper Makers Chemical Corp.

**COATINGS, Protective**
Stebbins Engrg. & Mfg. Co.

**COCKS, Lubricated**
Crane Company

**COGS**
Bowsher, N. P., The

**COLLAPSIBLE WINDER SHAFTS**
Moore & White Co.

**COLORIMETERS**
Bausch & Lomb Optical Co.
Testing Machines, Inc.

**COLOR ANALYZERS**
Pfaltz and Bauer
Testing Machines, Inc.
Thwing Instrument Co.

**COLOR MIXING EQUIPMENT**
Waldron, John, Corp.

**COMBINING MACHINES**
Waldron, John, Corp.

**COMPOUNDS, Acid Resisting**
Stebbins Engrg. & Mfg. Co.

**COMPRESSORS (Air)**
Allis-Chalmers Mfg. Co.
Roots-Connersville Blower Corp.

**COMPRESSORS (Centrifugal)**
De Laval Steam Turbine Co.

**CONSISTENCY REGULATOR**
Trimbey Machine Works

**CONTINUOUS BEATERS**
Improved Paper Mchy. Corp.
Noble & Wood Machine Co.
Valley Iron Works Co.

**CONTINUOUS BEATER WATER FEEDER**
Trimbey Machine Works

**CONTINUOUS PULPERS**
Noble & Wood Machine Co.

**CONTRACTORS, Engineering**
Stebbins Engrg. & Mfg. Co.

**CONTROLLING INSTRUMENTS**
Bristol Co., The
R. Fuess, Inc.
Minneapolis-Honeywell Co.
The Brown Instrument Co.
Testing Machines, Inc.
Thwing Instrument Co.

**CONTROLS (Electric)**
Minneapolis-Honeywell Co.
The Brown Instrument Co.
Thwing Instrument Co.

**CONVEYOR CHAINS**
Jeffrey Mfg. Co.
Link-Belt Co.

**CONVEYORS (Trim)**
Jeffrey Mfg. Co.
Link-Belt Co.
Ross Engineering Corp., J. O.

**COOKING & RECOVERY PROCESS**
Chemipulp Process, Inc.
Ross Engineering Corp., J. O.

# WHERE TO BUY

**COOLERS**
Stebbins Engrg. & Mfg. Co.
**CORES (Paper)**
Elixman Paper Co.
**CORES (Steel)**
Smith & Winchester Mfg. Co.
**COTTON CALENDER ROLLER**
Perkins & Son, Inc., B. F.
**COUCH ROLLS**
American Wringer Co.
Beloit Iron Works
D. J. Murray Mfg. Co.
Goodrich Rubber Co., B. F.
Montague Machine Co.
Moore & White Co., The
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.
Stowe-Woodward, Inc.
**COUPLINGS**
Beloit Iron Works
De Laval Steam Turbine Co.
Jeffrey Mfg. Co.
Philadelphia Gear Works
T. B. Wood's Sons
The Frederick Iron & Steel Co.
Waldron Corp., John
Walworth Co.
**CREPING MACHINES**
Beloit Iron Works
Downingtown Mfg. Co.
Hudson Sharp Machine Co.
Paper Converting Machine Co., Inc.
John Waldron Corp.
**CUTTERS**
Beloit Iron Works
Downingtown Mfg. Co.
**CYLINDER RAILROAD AND DEVIL DUSTER**
Moore & White Co.
**CYLINDER DRIVES**
Moore & White Co.
**CYLINDER MOULDS**
Beloit Iron Works
D. J. Murray Mfg. Co.
Improved Paper Mchy. Corp.
Downingtown Mfg. Co.
**CYLINDER WIRES**
Appleton Wire Works
International Wire Works
**DAMPENERS**
Perkins & Son., Inc., B. F.
**DAMPER REGULATORS**
Minneapolis-Honeywell Co.
The Brown Instrument Co.
**DECKERS**
Bird Machine Company
D. J. Murray Mfg. Co.
Improved Paper Mchy. Corp.
Montague Machine Co.
Oliver United Filters Inc.
Valley Iron Works
**DECKLE STRAPS**
Stowe-Woodward, Inc.
**DEFOAMERS**
National Oil Products Co.
**DIE CUTTERS**
Appleton Machine Co., The
**DIESEL ENGINES**
Winton Engine Co.
**DIGESTERS**
Manitowoc Engrg. Wks.
Stebbins Engrg. & Mfg. Co.
**DIGESTER FITTINGS**
W. J. Murray Mfg. Co.
**DIGESTER LININGS**
Stebbins Engrg. & Mfg. Co.
**DOCTORS**
Bird Machine Company
**DOCTOR BLADES**
Goodrich Rubber Co., B. F.
Improved Paper Mchy. Corp.
International Nickel Co.
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.
Stowe-Woodward, Inc.
**DRAINAGE SYSTEMS**
Stickle Steam Specialties Co.
**DRIVES**
Bird Machine Company
D. J. Murray Mfg. Co.
**DRIVE STANDS**
Beloit Iron Works
Moore & White Co.
**DRIVES (Paper Machinery)**
Beloit Iron Works
Farrel-Birmingham Co.
General Electric Co.
Link-Belt Co.
**DRYING SYSTEMS**
Ross Engineering Corp., J. O.
Waldron Corporation, The
**DUSTING MACHINERY**
Moore & White Co.
**DUSTERS (Chip)**
D. J. Murray Mfg. Co.
**DYESTUFFS & COLORS**
E. I. DuPont de Nemours & Co.
General Dyestuff Corp.
Heller & Merz
Geigy Co., The
National Aniline & Chemical Co.
C. K. Williams & Co.
**ELECTRIC EQUIPMENT**
Allis-Chalmers Mfg. Co.
General Electric Co.
Manufacturers Supply Co.
**END GRAIN JORDAN WOODS**
Noble & Wood Machine Co.
**EMBOSSING CALENDERS**
Perkins & Sons, Inc., B. F.
Textile Finishing Machinery
**EMBOSSING MACHINES**
Hudson Sharp Machine Co.
Paper Converting Machine Co.
John Waldron Corp.
**EMBOSSING ROLLS**
The Appleton Machine Co.
Hudson Sharp Machine Co.
B. F. Perkins & Son, Inc.
Roehlen Engraving Works, Inc.
Waldron Corporation, John
**EXTRACTORS**
Bird Machine Company
Downingtown Manufacturing Co.
Valley Iron Works Co.
**FANS**
B. F. Perkins & Son, Inc.
Ross Engineering Co., J. O.
**FAN CONTROLS (Ventilating)**
Minneapolis-Honeywell Co.
The Brown Instrument Co.
**FAN PUMPS**
Beloit Iron Works
Moore & White Co.
Valley Iron Works Co.
Smith & Winchester Mfg. Co.
**FELT CARRIER ROLLS**
American Wringer Co.
Beloit Iron Works
Downingtown Mfg. Co.
Goodrich Rubber Co., B. F.
Stowe-Woodward, Inc.
**FELT CLEANERS**
Magnus Chemical Co.
**FELT CONDITIONERS**
Bird Machine Company
**FELTS AND JACKETS**
Appleton Woolen Mills
Bulkley, Dunton & Co.
Draper Bros. Co.
Huyck & Son, E. C.
Knox Woolen Co.
Lockport Felt Co.
Orr Felt & Blanket Co.
Shuler & Benninghofen
Turner, Halsey Co.
Waterbury Felt Co.
**FELT GUIDES**
Moore & White Co.
**FELT SOAPS**
Magnus Chemical Co.
**FELT TIGHTENER (Automatic)**
John Waldron Corp.
**FILLINGS (Jordan)**
International Nickel Co.
**FILTERS**
Improved Paper Mchy. Corp.
Moore & White Co.
Norwood Engrg. Co.
Oliver United Filters Inc.
J. O. Ross Engrg. Corp.
Stebbins Engrg. & Mfg. Co.
Swenson Evaporator Co.
**FILTER CLEANERS**
Magnus Chemical Co.
**FILTER WIRES**
Appleton Wire Works
**FITTINGS, Pipe (Plain end or flanged)**
Cooper Alloy Foundry Co.
Crane Company
Taylor Forge & Pipe Works
Walworth Company
**FITTINGS, Pipe Welding**
Taylor Forge & Pipe Works
**FLANGES**
Crane Company
Walworth Company
**FLANGES, Pipe (Forged Steel)**
Taylor Forge & Pipe Works
**FLAT SCREENS**
The Appleton Machine Co.
Beloit Iron Works
D. J. Murray Mfg. Co.
Downingtown Mfg. Co.
**FLEXIBLE COUPLINGS**
Beloit Iron Works
De Laval Steam Turbine Co.
The Frederick Iron & Steel Co.
Jeffrey Mfg. Co.
Link-Belt Co.
Philadelphia Gear Works
John Waldron Corp.
T. B. Wood's Sons
**FLEXIBLE SLICE**
Beloit Iron Works
**FLOORING**
Stebbins Engrg. & Mfg. Co.
**FLOOR PLATES (Steel)**
American Pressed Steel Co.
**FLOOR TILE (Non-Slip)**
Norton Co.
**FLOW METERS**
Minneapolis-Honeywell Co.
The Brown Instrument Co.
**FLY BARS**
Dilts Machine Works, Inc.
Jones & Sons Co., E. D.
Noble & Wood Machine Co.
**FOLDING ENDURANCE TESTERS**
Testing Machines, Inc.
**FOLDING MACHINES**
Hamblet Machine Co.
Hudson Sharp Machine Co.
Paper Converting Machine Co., Inc.
Waldron, John, Corp.
**FORMING MACHINES**
Downingtown Mfg. Co.
**FOURDRINIER MACHINES**
Beloit Iron Works
Downingtown Mfg. Co.
**FOURDRINIER WIRES**
Appleton Wire Works
International Wire Works
Lindsay Wire Weaving Co.
**FREENESS RECORDERS**
Trimbey Machine Works
**FREENESS TESTERS**
Testing Machines, Inc.
**FRICTION CALENDERS**
Perkins & Son, Inc., B. F.
**FRICTION CLUTCHES**
Beloit Iron Works
Link-Belt Co.
Moore & White Co.
T. B. Wood's Sons
**GALVANIZED IRON SHEETS**
The American Rolling Mill Company
**GALVANIZED STEEL SHEETS**
The American Rolling Mill Company
**GALVANIZED COPPER-BEARING STEEL SHEETS**
The American Rolling Mill Company
**GAS BURNER CONTROLS (Automatic Systems)**
Minneapolis-Honeywell Co.
The Brown Instrument Co.
**GEARS**
Farrel-Birmingham Co.
D. J. Murray Mfg. Co.
De Laval Steam Turbine Co.
Improved Paper Mchy. Corp.
Jeffrey Mfg. Co.
Link-Belt Co.
Moore & White Co.
Philadelphia Gear Works
John Waldron Corp.
**GENERATORS**
De Laval Steam Turbine Co.
General Electric Co.
**GRANITE ROLLS**
Beloit Iron Works
Downingtown Mfg. Co.
Perkins & Sons, Inc., B. F.
**GRATING (Sidewalk)**
Hendrick Mfg. Co.
**GRINDERS**
Montague Machine Co.
**GRINDING WHEELS**
Norton Co.
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.
**GUIDES (Automatic Web)**
John Waldron Corp.
**GUIDES (Felt)**
Moore & White Co.
**GUMMING AND GLUING MACHINERY**
Potdevin Machine Co.
Waldron Corporation, John
**GUMMED TAPE TESTERS**
Thwing Instrument Co.
**H. D. THICKENERS**
Oliver United Filters, Inc.
**HAND CLEANER**
Magnus Chemical Co.
**HAND CLEANER DISPENSERS**
Magnus Chemical Co.
**HANGERS**
T. B. Wood's Sons Co.
**HEATERS (Unit)**
D. J. Murray Mfg. Co.
J. O. Ross Engrg. Corp.
**HEATING AND VENTILATING SYSTEMS**
J. E. Singer & Son
Ross Engineering Corp., J. O.
**HIGH DENSITY THICKENERS**
Moore & White Co.
**HOISTS (Electric)**
General Electric Co.
**HOSE (Air, Water, Suction, etc.)**
Manhattan Rubber Mfg. Co.
**HOT ROLLED SHEETS**
The American Rolling Mill Company
**HOT ROLLED ANNEALED SHEETS**
The American Rolling Mill Company
**HYDRAULIC MACHINERY**
Farrel-Birmingham Co.
**INDICATORS**
The Bristol Co.
Minneapolis-Honeywell Co.
Testing Machines, Inc.
Thwing Instrument Co.
The Brown Instrument Co.
**INTERFOLDING MACHINES**
Hudson Sharp Machine Co.
Paper Converting Machine Co., Inc.
John Waldron Corp.
**INSTRUMENTS**
The Bristol Co.
R. Fuess, Inc.
Minneapolis-Honeywell Co.
Testing Machines, Inc.
The Brown Instrument Co.
Thwing-Albert Instrument Co.
Wilson Mechanical Instrument Co.
**IRON CASTINGS**
D. J. Murray Mfg. Co.
The Frederick Iron & Steel Co.
**JORDANS**
The Appleton Machine Co.
Smith & Winchester Mfg. Co.
Valley Iron Works
**JORDAN ENGINES**
Noble & Wood Machine Co.
**JORDAN FILLINGS**
Bahr Bros. Mfg. Co., The
Noble & Wood Machine Co.
Smith & Winchester Mfg. Co.
Valley Iron Works
**JORDAN PLUGS**
Noble & Wood Machine Co.
**KNIVES, ETC.**
Dilts Machine Works, Inc.
Hamblet Machine Co.
Taylor, Stiles & Co.
**LABELLING MACHINES**
Potdevin Machine Co.
**LABORATORY EQUIPMENT**
R. Fuess, Inc.
Noble & Wood Machine Co.
Testing Machines, Inc.
Thwing-Albert Instrument Co.
Valley Iron Works
Wilkens-Anderson Co.
**LATHES**
Montague Machine Co.
**LAY BOYS**
Hamblet Machine Co.
Moore & White Co.
**LEVELERS**
National Oil Products Co.
**LIME MUD FILTERS**
Oliver United Filters, Inc.
**LITHOPONE**
Krebs Pigment & Color Corp.
New Jersey Zinc Co.
**LOFT DRYERS**
Ross Engineering Corp., J. O.
John Waldron Corp.
**LUBRICANTS**
Gulf Refining Co.
Standard Oil Co. of Indiana
Tidewater Oil Co.
**MAGNIFIERS (Pocket)**
Bausch & Lomb Optical Co.
R. Fuess, Inc.
**MARKING BANDS (Rubber)**
Stowe-Woodward, Inc.
**METERS**
Minneapolis-Honeywell Co.
The Brown Instrument Co.
**METERING & PROPORTIONING SYSTEMS**
Minneapolis-Honeywell Co.
The Brown Instrument Co.
Trimbey Machine Works
**MICROMETERS**
Cady, E. J. & Co
International Nickel Co.
Montague Machine Co.
Testing Machines, Inc.
**MICRO-PROJECTORS**
Bausch & Lomb Optical Co.
**MICROSCOPES**
Bausch & Lomb Optical Co.
R. Fuess, Inc.
Testing Machines, Inc.
**MOTORS**
Allis-Chalmers Mfg. Co.
General Electric Co.
Manufacturers Supply Co.
**NAPKIN FOLDING MACHINE**
Hudson Sharp Machine Co.
Paper Converting Machine Co., Inc.
Waldron, John, Corp.
**NON-SLIP FLOOR STEEL**
American Pressed Steel Co.

# WHERE TO BUY

**OPACIFYING PIGMENT**
Chemical and Pigment Co.
Krebs Pigment Co.
New Jersey Zinc Co.
Titanium Pigment Co.
R. T. Vanderbilt Co.

**PACKAGING MACHINES**
Hudson Sharp Machine Co.

**PACKING**
Stebbins Engrg. & Mfg. Co.

**PACKING (Rubber)**
B. F. Goodrich Rubber Co.
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.

**PAPER BAG MACHINERY**
Potdevin Machine Co.
Smith & Winchester Mfg. Co.
Weber, Herman G.

**PAPER BREAK RECORDERS**
Thwing-Albert Instrument Co.

**PAPER CUTTERS**
Downingtown Mfg. Co.
Hamblet Machine Company
Moore & White Co.
Smith & Winchester Mfg. Co.

**PAPER MACHINES**
Beloit Iron Works
Downingtown Mfg. Co.

**PAPER MACHINE APRONS**
Goodrich Rubber Co., B. F.

**PAPER MACHINE DRIVES**
Beloit Iron Works
Downingtown Mfg. Co.

**PAPER MACHINE DRIER CONTROL SYSTEMS**
Minneapolis-Honeywell Co.
The Brown Instrument Co.

**PAPER MANUFACTURERS**
Hammermill Paper Co.
West Virginia Pulp & Paper Co.

**PAPER MACHINE HOODS**
Ross Engineering Corp., J. O.

**PAPER MACHINE SLICES**
Beloit Iron Works
Montague Machine Co.

**PAPER AND BOARD CUTTERS**
Beloit Iron Works

**PAPER AND PULP MACHINERY**
Beloit Iron Works
Downingtown Manufacturing Co.
Farrel-Birmingham Co.
Lobdell Car Wheel Co.
Moore & White Co.
Perkins & Son, Inc., B. F.
Smith & Winchester Mfg. Co.
Valley Iron Works Co.

**PAPER ROLLS**
B. F. Perkins & Son, Inc.
Waldron Corp., John

**PAPER SCALES**
Testing Machines, Inc.
Thwing-Albert Instrument Co.

**PAPER TESTERS**
R. Fuess, Inc.
Perkins & Son, Inc., B. F.
Testing Machines, Inc.
Thwing-Albert Instrument Co.
Valley Iron Works Co.
Wilson Mechanical Instrument Co.

**PAPER TUBE MACHINERY**
Diets Machine Works
Langston Co., Samuel M.

**PAPER WAXING MACHINERY**
Waldron, Corp., John

**PAPER PULPING ENGINES**
Noble & Wood Machine Co.

**PASTING MACHINES**
Beloit Iron Works
Potdevin Machine Co.
John Waldron Corp.
Weber, Herman G.

**PENESCOPE PENETRATION TESTER**
Thwing-Albert Instrument Co.

**PERFORATING MACHINES**
Diets Machine Works
Waldron John, Corp.

**PERFORATED METAL**
Harrington & King Perforating Co.
Hendrick Mfg. Co.

**PHOTO ELECTRIC APPARATUS**
Pfaltz and Bauer

**pH CONTROL**
Wallace & Tiernan, Co., Inc.

**pH TESTERS**
Wallace & Tiernan, Co., Inc.
Wilkens-Anderson Co.

**PILLOW BLOCKS**
T. B. Wood's Sons Co.

**PIPE.**
Mueller Brass Co.

**PIPE (Stainless)**
International Nickel Co.
Mundt & Sons, Charles

**PIPE (Wood)**
Wyckoff, A., & Son

**PIPING**
Mueller Brass Co.
J. E. Singer & Son
Crane Company
Walworth Co.

**PIPE FITTING**
J. E. Singer & Son

**PLATES, Filter**
Stebbins Engrg. & Mfg. Co.

**PLATES (Floor)**
American Pressed Steel Co.

**PLATES, IRON**
The American Rolling Mill Company

**PLATES, STEEL**
The American Rolling Mill Company

**PLATING, CHROMIUM**
Chromium Corp. of America

**PLATERS**
Perkins & Son, Inc., B. F.

**PLAYING CARD MACHINERY**
Waldron, John, Corp.

**POWER PLANT EQUIPMENT**
Jeffrey Mfg. Co.
Manufacturers Supply Co.

**POWER TRANSMISSION EQUIPMENT**
Bird Machine Company
De Laval Steam Turbine Co.
Farrel-Birmingham Co.
Jeffrey Mfg. Co.
Link-Belt Co.
Manufacturers Supply Co.
Philadelphia Gear Works
T. B. Wood's Sons

**PRECISION INSTRUMENTS**
The Bristol Co.
R. Fuess, Inc.
Taylor Instrument Co.
Testing Machines, Inc.
Thwing-Albert Instrument Co.

**PREHYDRATION SYSTEMS**
Noble & Wood Machine Co.

**PRESSES (Napkin)**
Paper Converting Machine Co., Inc.
Waldron Corp., John

**PRESS ROLLS**
American Wringer Co., Inc.
Beloit Iron Works
Downingtown Mfg. Co.
Goodrich Rubber Co.
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.
Montague Machine Co.
Stowe-Woodward, Inc.
Valley Iron Works Co.

**PRESS ROLLS (Granite)**
Beloit Iron Works
Perkins & Sons, Inc., B. F.

**PRESSURE BULKER**
B. F. Perkins & Son, Inc.

**PRINTING MACHINES**
Potdevin Machine Co.
Waldron, John, Corp.
Weber, Herman G.

**PRINTING PRESSES**
Hudson Sharp Machine Co.
Potdevin Machine Co.
Paper Converting Machine Co., Inc.
John Waldron Corp.
Weber, Herman G.

**PROPELLERS**
Noble & Wood Machine Co.

**PROPELLER AGITATORS**
Noble & Wood Machine Co.

**PULLEYS**
Improved Paper Mchy. Corp.
Jeffrey Mfg. Co.
Link-Belt Co.
Montague Machine Co.
D. J. Murray Mfg. Co.
T. B. Wood's Sons

**PULP MILL EQUIPMENT (Chemical)**
Chemipulp Process, Inc.

**PULPSTONES**
Norton Co.

**PULPS**
Andersen Co., J.
Castle & Overton
Gottesman & Co., Inc.
Lagerloef Trading Co.
Pagel, Horton
Perkins-Goodwin Co.
Price & Pierce, Ltd.
Pulp and Paper Trading Co.

**PULP SCREENS**
Bird Machine Company
D. J. Murray Mfg. Co.
Trimbey Machine Works

**PULP AND PAPER MILL MACHINERY**
Bird Machine Company
D. J. Murray Mfg. Co.
Stebbins Engrg. & Mfg. Co.

**PULP THICKENERS**
Bird Machine Company
D. J. Murray Mfg. Co.
Downingtown Mfg. Co.
Moore & White Co.

**PULP WASHERS**
Oliver United Filters, Inc.

**PULP WOOD MACHINERY**
Montague Machine Co.

**PULPWOOD STACKERS**
Jeffrey Mfg. Co.

**PUMP PRIMERS (Steam and Water Jet)**
Valley Iron Works Co.

**PUMP VALVE BALLS (Rubber)**
Stowe-Woodward, Inc.

**PUMPS (Acid)**
De Laval Steam Turbine Co.
Frederick Iron and Steel Co.
Moore & White Co.
Oliver United Filters Inc.
The Frederick Iron & Steel Co.
Roots-Connersville Blower Corp.
Valley Iron Works

**PUMPS (Centrifugal)**
Allis-Chalmers Co.
Downingtown Mfg. Co.
The Frederick Iron & Steel Co.
Oliver United Filters, Inc.

**PUMPS (Circulating)**
Minneapolis-Honeywell Co.
The Brown Instrument Co.

**PUMPS (Rotary Cycloidal)**
Roots-Connersville Blower Corp.

**PUMPS (Stuff)**
Allis-Chalmers Co.
Beloit Iron Works
De Laval Steam Turbine Co.
Downingtown Mfg. Co.
The Frederick Iron & Steel Co.
International Nickel Co.
Moore & White Co.
Oliver United Filters Inc.
Smith & Winchester Mfg. Co.
Valley Iron Works Co.

**PUMPS (Suction)**
Moore & White Co.

**PUMPS (Vacuum)**
Oliver United Filters, Inc.
Roots-Connersville Blower Corp.

**PYROMETERS (Roll)**
The Bristol Co.
Testing Machines, Inc.
Thwing-Albert Instrument Co.

**PYROMETERS (Surface—Optical—Radiation)**
Minneapolis-Honeywell Co.
The Brown Instrument Co.
Testing Machines, Inc.
Thwing-Albert Instrument Co.

**RAG CUTTERS**
Perkins & Son, Inc., B. F.
Taylor Stiles & Co.

**REAM COUNTERS**
Hamblet Machine Co.

**RECORDING INSTRUMENTS**
The Bristol Co.
Minneapolis-Honeywell Co.
The Brown Instrument Co.
Taylor Instrument Co.
Testing Machines, Inc.
Thwing-Albert Instrument Co.

**RECORDING TACHOMETERS**
The Bristol Co.
General Electric Co.
Minneapolis-Honeywell Co.
The Brown Instrument Co.

**RECOVERY OF WASTE PRODUCTS**
Stebbins Engrg. & Mfg. Co.

**RECOVERY SYSTEMS (Soda, Sulphate & Sulphite)**
D. J. Murray Mfg. Co.
Ross Engineering Corp., J. O.
Research Corporation
Swenson Evaporator Co.

**RECOVERY SYSTEMS (Waste Heat)**
Research Corporation
Ross Engrg. Corp., J. O.

**REELS**
Downingtown Mfg. Co.
Hudson Sharp Machine Co.

**REELS (Upright & Revolving)**
Beloit Iron Works
De Laval Steam Turbine Co.
Moore & White Co.

**REFINERS**
Bahr Bros.
Bauer Bros.

**REFRACTORIES**
Norton Co.

**REGULATORS**
The Bristol Co.
Mason Neilan Regulator Co.
Minneapolis-Honeywell Co.
The Brown Instrument Co.
Trimbey Machine Works

**REGULATORS (Humidity)**
Minneapolis-Honeywell Co.
The Brown Instrument Co.

**REWINDERS**
Beloit Iron Works
Cameron Machine Co.
Dietz Machine Works
Downingtown Mfg. Co.
Hamblet Machine Co.
Langston Co., Samuel M.
Moore & White Co.
Smith & Winchester Mfg. Co.
John Waldron Corp.

**ROD MILL**
Allis-Chalmers Co.
Mine & Smelter Supply Co.

**ROLLS**
American Wringer Co.
Beloit Iron Works
Downingtown Mfg. Co.
Goodrich Rubber Co.
Improved Paper Mchy. Corp.
Montague Machine Co.
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.
Roehlen Engraving Works, Inc.
Stowe-Woodward, Inc.
John Waldron Corp.

**ROLLS (Chilled Iron & Gray Iron)**
Farrel-Birmingham Co.
Improved Paper Mchy. Corp.
Lobdell Car Wheel Co.
Smith & Winchester Mfg. Co.
Valley Iron Works

**ROLLS (Rubber or Rubber Covered)**
American Wringer Co.
Beloit Iron Works
B. F. Goodrich Rubber Co.
D. J. Murray Mfg. Co.
Downingtown Mfg. Co.
Improved Paper Mchy. Corp.
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.
Montague Machine Co.
Stowe-Woodward, Inc.
United States Rubber Co.

**ROLL GRINDERS**
Farrel-Birmingham Co.
Lobdell Car Wheel Co.

**ROLL SLITTING MACHINES**
Cameron Machine Co.
Langston Co., Samuel M.

**ROLL STANDS**
Cameron Machine Co.
Moore & White Co.

**ROLL WINDING MACHINES**
Cameron Machine Co.

**ROOFING**
J. E. Singer & Son

**ROPE DRIVES**
Allis-Chalmers Mfg. Co.

**ROSIN SIZE**
American Cyanamid & Chemical Corp.
Bennett, Inc.
Paper Makers Chemical Corp.

**ROTARY SCREENS**
Bird Machine Company
Moore & White Co.
Valley Iron Works

**RUBBER GOODS**
American Wringer Co.
Goodyear Tire & Rubber Co.
B. F. Goodrich Rubber Co.
The Manhattan Rubber Mfg. Co.
Stowe-Woodward, Inc.

**RUBBER COVERING**
Manhattan Rubber Mfg. Co.

**RUBBER HOSE**
B. F. Goodrich Rubber Co.
Goodyear Tire & Rubber Co.
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.

**SALT**
Pennsylvania Salt Co.

**SAND & POLISHING MACHINES**
Waldron, John, Corp.

**SATURATING MACHINES**
Moore & White Co.
Potdevin Machine Co.
Waldron, John, Corp.
Weber, Herman G.

**SAVEALLS**
Bird Machine Company
De Laval Steam Turbine Co.
Downingtown Mfg. Co.
Improved Paper Mchy. Corp.
Moore & White Co.
Oliver United Filters, Inc.

# WHERE TO BUY

**SCALES**
Cady, E. J. & Co.
Testing Machines, Inc.
Thwing-Albert Instrument Co.

**SCORE TESTERS**
Testing Machines, Inc.
Thwing-Albert Instrument Co.

**SCREEN DIAPHRAGMS**
Goodrich Rubber Co., B. F.
Manhattan Rubber Mfg. Co.

**SCREENS**
Appleton Wire Works
Beloit Iron Works
Bird Machine Company
D. J. Murray Mfg. Co.
Downingtown Mfg. Co.
International Wire Works
Improved Paper Mchy. Corp.
Jeffrey Mfg. Co.
Link-Belt Co.
Montague Machine Co.
Moore & White Co.
Valley Iron Works Co.

**SCREENS (Perforated Metal)**
Harrington & King Perforating Co.
Hendrick Manufacturing Co.
Charles Mundt & Sons

**SCREEN PLATE**
Bird Machine Company
D. J. Murray Mfg. Co.
Hendrick Mfg. Co.
Improved Paper Mchy. Corp.

**SHAFTS (Forged)**
T. B. Wood's Sons

**SHEET MACHINE**
Noble & Wood Machine Co.

**SHEET METAL WORK**
J. E. Singer & Son

**SHEAVES**
Montague Machine Co.
T. B. Wood's Sons Co.

**SHOWER PIPES**
Bird Machine Company
Downingtown Mfg. Co.
Montague Machine Co.
Moore & White Co.
Smith & Winchester Mfg. Co.

**SHREDDERS (Pulp and Paper)**
Jeffrey Mfg. Co.
Taylor Stiles & Co.

**SILICATE OF SODA**
American Cyanamid & Chemical Corp.
Philadelphia Quartz Co.

**SIZING**
National Oil Products

**SIZING PROCESS**
Bennett, Inc.
National Oil Products Co.
Ross Engrg. Corp., J. O.

**SLIME ELIMINATION**
Wallace & Tiernan, Co., Inc.

**SLIME REMOVER**
Magnus Chemical Co.

**SLITTERS AND REWINDERS**
Beloit Iron Works
Cameron Machine Co.
Dietz Machine Works
Downingtown Mfg. Co.
Hamblett Machine Co.
Langston Co., Samuel M.
Moore & White Co.
Smith & Winchester Mfg. Co.
Waldron Corporation, John

**SODA ASH**
American Cyanamid & Chemical Corp.
Mathieson Alkali Works, Inc.
Paper Makers Chemical Corp.
Pennsylvania Salt Mfg. Co.
Solvay Sales Corp.

**SOAP POWDER**
Magnus Chemical Co.
Paper Makers Chemical Corp.

**SODIUM METASILICATE**
Philadelphia Quartz Co.

**SORTING TABLES**
Moore & White Co.

**SPECIAL MACHINERY**
D. J. Murray Mfg. Co.
Downingtown Mfg. Co.
Farrel-Birmingham Co.
Hamblet Machine Co.
Hudson Sharp Machine Co.
Montague Machine Co.
Paper Converting Machine Co., Inc.
John Waldron Corp.

**SPECIAL PIPE FITTINGS**
The American Rolling Mill Company

**SPEED CHANGES (Variable)**
Moore & White Co.

**SPEED REDUCERS**
Beloit Iron Works
De Laval Steam Turbine Co.
Farrel-Birmingham Co.
Link-Belt Co.
Philadelphia Gear Works

**SPIRAL BEVEL GEARS DRIVE STANDS**
Beloit Iron Works
Moore & White Co.
Philadelphia Gear Works

**SPIRAL WELDED PIPE**
The American Rolling Mill Company

**SPROCKETS**
Improved Paper Mchy. Corp.

**STAINLESS STEEL SHEETS**
The American Rolling Mill Company

**STAINLESS STEEL STRIP**
The American Rolling Mill Company

**STAINLESS STEEL PLATES**
The American Rolling Mill Company

**STAIR and FLOOR TILES—(Non-Slip)**
Norton Company

**STAIR TREADS**
Norton Company

**STARCH**
American Cyanamid & Chemical Corp.
Clinton Co.
Corn Products Refining Co.

**STEAM SPECIALTIES**
Crane Company
Stickle Steam Specialties Co.

**STEEL (Electric Furnace)**
Timken Roller Bearing Co.

**STEEL (Open Hearth)**
Timken Roller Bearing Co.

**STEEL PLATE CONSTRUCTION**
Hendrick Mfg. Co.
Link-Belt Co.
Ross Engrg. Corp., J. O.

**STOCK CUTTERS**
Perkins & Sons, Inc., B. F.

**STOKERS—Screw or Plunger Type**
The Frederick Iron & Steel Co.
Swenson Evaporator Co.

**STOCK REGULATORS**
Trimbey Machine Co.

**STRAW MAKING MACHINERY**
Samuel H. Langston Co.

**STUFF CHESTS**
D. J. Murray Mfg. Co.
Downingtown Mfg. Co.
Improved Paper Mchy. Corp.
Jones & Sons Co., E. D.
Kalamazoo Tank & Silo Co.
Moore & White Co.
Noble & Wood Machine Co.
Valley Iron Works Co.

**STUFF PUMPS**
Beloit Iron Works
De Laval Steam Turbine Co.
Downingtown Mfg. Co.
The Frederick Iron & Steel Co.
Moore & White Co.
Noble & Wood Machine Co.
Smith & Winchester Mfg. Co.
Valley Iron Works Co.

**SUCTION BOXES**
Downingtown Mfg. Co.

**SUCTION BOX COVERS**
Moore & White Co.

**SUCTION ROLLS**
American Wringer Co.
Beloit Iron Works
Downingtown Mfg. Co.

**SUCTION FELT ROLLS**
Beloit Iron Works
Downingtown Mfg. Co.

**SULPHITE (Bleached and Unbleached)**
Anderson & Co., J.
Castle & Overton
Gottesman & Co., Inc.
Lagerloef Trading Co.
Perkins-Goodwin Co.
Price & Pierce, Ltd.

**SULPHUR**
American Cyanamid & Chemical Corp.
Texas Gulf Sulphur Co.

**SUPER CALENDERS**
Beloit Iron Works
Farrel-Birmingham Co.
Lobdell Car Wheel Co.
Moore & White Co.
Norwood Engrg. Co.
Perkins & Son, Inc., B. F.
Smith & Winchester Mfg. Co.

**SURFACE PYROMETERS**
Testing Machines, Inc.
Thwing-Albert Instrument Co.

**TABLE ROLLS**
American Wringer Co.
Beloit Iron Works
Goodrich Rubber Co., B. F.
Manhattan Rubber Mfg. Co.
Stowe-Woodward, Inc.

**TACHOMETERS**
Minneapolis-Honeywell Co.
The Brown Instrument Co.
The Bristol Co.
Testing Machines, Inc.

**TANKS**
Hendrick Mfg. Co.
International Nickel Co.
Kalamazoo Tank & Silo Co.
Manitowoc Engrg. Wks.
The Manhattan Rubber Mfg. Co.
J. O. Ross Engrg. Corp.
Stebbins Engrg. & Mfg. Co.

**TEAR TESTERS**
Testing Machines, Inc.
Thwing-Albert Instrument Co.

**TELETYPE MACHINES**
American Tel. & Tel. Co.

**TEMPERATURE RECORDERS**
The Bristol Co.
R. Fuess, Inc.
Taylor Instrument Co.
Testing Machines, Inc.
Thwing-Albert Instrument Co.

**TENSILE TESTERS**
Perkins & Sons, Inc., B. F.
Testing Machines, Inc.
Thwing-Albert Instrument Co.

**TESTERS (Bursting Strength)**
Cady, E. J. & Co.
Testing Machines, Inc.
Perkins & Sons, Inc., B. F.

**TESTERS (pH)**
Thwing-Albert Instrument Co.
Wallace & Tiernan, Co., Inc.
Wilkens-Anderson Co.

**TESTERS (Smoothness)**
R. Fuess, Inc.

**TESTERS (Stiffness)**
R. Fuess, Inc.
Testing Instruments, Inc.
Thwing-Albert Instrument Co.

**TESTING INSTRUMENTS (Thickness Test)**
E. J. Cady & Co.
Testing Instruments, Inc.

**TESTING INSTRUMENTS (Basis Weights)**
E. J. Cady & Co.
R. Fuess, Inc.
Testing Instruments, Inc.
Thwing-Albert Instrument Co.

**TESTING LABORATORY**
E. I. DuPont De Nemours & Co., Inc.

**THERMOMETERS**
Minneapolis-Honeywell Co.
The Brown Instrument Co.
The Bristol Co.
R. Fuess, Inc.
Taylor Instrument Co.
Testing Machines, Inc.
International Nickel Co.

**THICKENERS**
Bird Machine Company
D. J. Murray Mfg. Co.
Improved Paper Mchy. Corp.
Oliver United Filters, Inc.

**TITANIUM PIGMENT**
Krebs Pigment & Color Corp.
Titanium Pigment Co.
R. T. Vanderbilt Co.

**TIE RODS**
International Nickel Co.

**TOILET FOLDING MACHINES**
Hudson Sharp Machine Co.
Paper Converting Machine Co., Inc.

**TOILET WINDERS**
Cameron Machine Co.
Dietz Machine Works
Hudson Sharp Machine Co.

**TOWEL FOLDING MACHINES**
Paper Converting Machine Co., Inc.
Waldron Corp., John

**TOWEL INTERFOLDING MACHINES**
Dietz Machine Works
Hudson Sharp Machine Co.

**TOWEL WINDER**
Cameron Machine Co.
Hudson Sharp Machine Co.
Waldron Corp., John

**TOWERS**
Cameron Machine Co.
Hudson Sharp Machine Co.
Stebbins Engrg. & Mfg. Co.
Waldron Corp., John

**TRANSMISSION MACHINERY**
Beloit Iron Works
De Laval Steam Turbine Co.
Farrel-Birmingham Co.
Jeffrey Mfg. Co.
Link-Belt Co.
T. B. Wood's Sons
Timken Roller-Bearing Co.

**TREADS (Non-Slip)**
Norton Company

**TRAPS (Steam)**
Crane Company

**TRUCKS**
Moore & White Co.

**TUBES (Paper)**
Ellixman Paper Core Co.

**TUBING (Seamless Steel)**
Timken Roller Bearing Co.

**TUBS (Wood)**
De Laval Steam Turbine Co.

**TURBINES (Hydraulic)**
Allis-Chalmers Mfg. Co.
De Laval Steam Turbine Co.
Roots-Connersville Blower Corp.

**TURBINES (Water)**
De Laval Steam Turbine Co.

**TURBO-GENERATORS**
Allis-Chalmers Mfg. Co.
De Laval Steam Turbine Co.

**USED EQUIPMENT**
Manufacturers Supply Co.

**V-BELTS**
Allis-Chalmers Mfg. Co.
L. H. Gilmer Co.
B. F. Goodrich Rubber Co.
Goodyear Tire & Rubber Co.
Manhattan Rubber Mfg. Co.
T. B. Wood's Sons

**VACUUM CONTROL**
Appleton Machine Co.

**VALVES**
Cooper Alloy Foundry Co.
Crane Company
Hills-McCanna Co.
D. J. Murray Mfg. Co.
International Nickel Co.
Minneapolis-Honeywell Co.
The Brown Instrument Co.
Ross Engineering Corp.
Trimby Machine Works
Walworth Co.

**VENTILATING SYSTEMS**
J. O. Ross Engrg. Corp.

**WASHERS**
Bird Machine Company
Downingtown Mfg. Co.
Improved Paper Mchy. Corp.
Moore & White Co.
Oliver United Filters Inc.
Swenson Evaporator Co.

**WASHERS (Stock)**
Bird Machine Company
Improved Paper Mchy. Corp.

**WASHERS (Wood)**
Downingtown Mfg. Co.

**WAXING MACHINERY**
Potdevin Machine Co.
Waldron, John, Corp.
Weber, Herman G.

**WAX SIZE**
American Cyanamid & Chemical Corp.
Bennett, Inc.
National Oil Products Co.
Paper Makers Chemical Corp.

**WET MACHINES**
Downingtown Mfg. Co.
Improved Paper Mchy. Corp.
Montague Machine Co.
Smith & Winchester Mfg. Co.
Valley Iron Works Co.

**WINDERS**
Beloit Iron Works
Cameron Machine Co.
Downingtown Mfg. Co.
Langston Co., Samuel M.
Moore & White Co.
Smith & Winchester Mfg. Co.
John Waldron Corp.

**WIRES**
Appleton Wire Works
Improved Paper Mchy. Corp.
International Wire Works
Lindsay Wire Weaving Co.
Purves Machine Wire Co., Inc.

**WIRE CLEANERS**
Magnus Chemical Co.

**WIRE CLOTH**
International Nickel Co.

**WIRE CLOTH (Filter)**
Oliver United Filters, Inc

**WIRE GUIDES**
Moore & White Co.
John Waldron Corp.

**WIRE GUIDE ROLLS**
American Wringer Co.
Goodrich Rubber Co., B. F.
Stowe-Woodward, Inc.

**WIRE STRETCH ROLLS**
American Wringer Co.
Stowe-Woodward, Inc.
Valley Iron Works Co.

**WOOD SPLITTERS**
D. J. Murray Mfg. Co.
Moore & White Co.

**WORMED CUTTERS**
American Wringer Co.
Stowe-Woodward, Inc.

**WRENCHES**
Walworth Co.

**ZINC DUST**
New Jersey Zinc Co.

**ZINC OXIDE PIGMENT**
New Jersey Zinc Co.

**ZINC SULPHIDE PIGMENT**
New Jersey Zinc Co.

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# PAPER TRADE JOURNAL

ESTABLISHED 1872

SIXTY-FOURTH YEAR

THE INTERNATIONAL WEEKLY OF THE PAPER AND PULP INDUSTRY AND THE PIONEER PUBLICATION IN ITS FIELD

Published Every Thursday by the LOCKWOOD TRADE JOURNAL CO., Inc.

GEO. S. MACDONALD, President — JOSEPH P. HORGAN, Secretary

Published at 34 No. Crystal St., East Stroudsburg, Pa.
Executive and Editorial Offices: 15 West 47th Street, New York
*Chicago Office:* 123 West Madison St.


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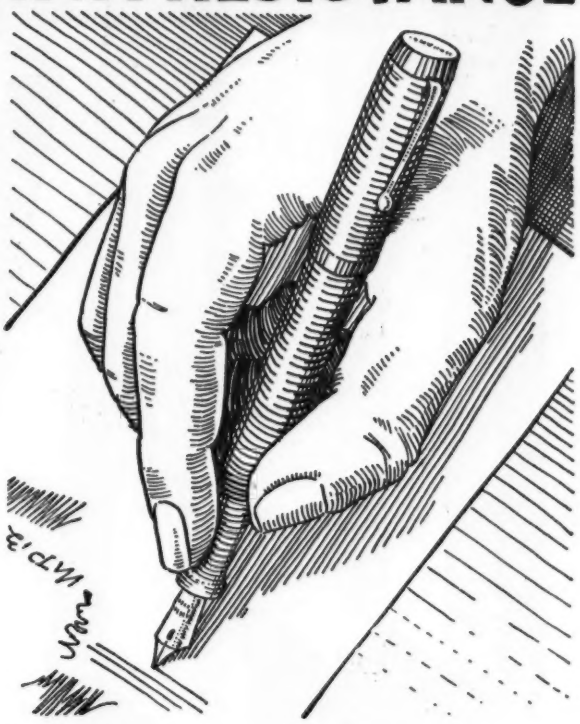

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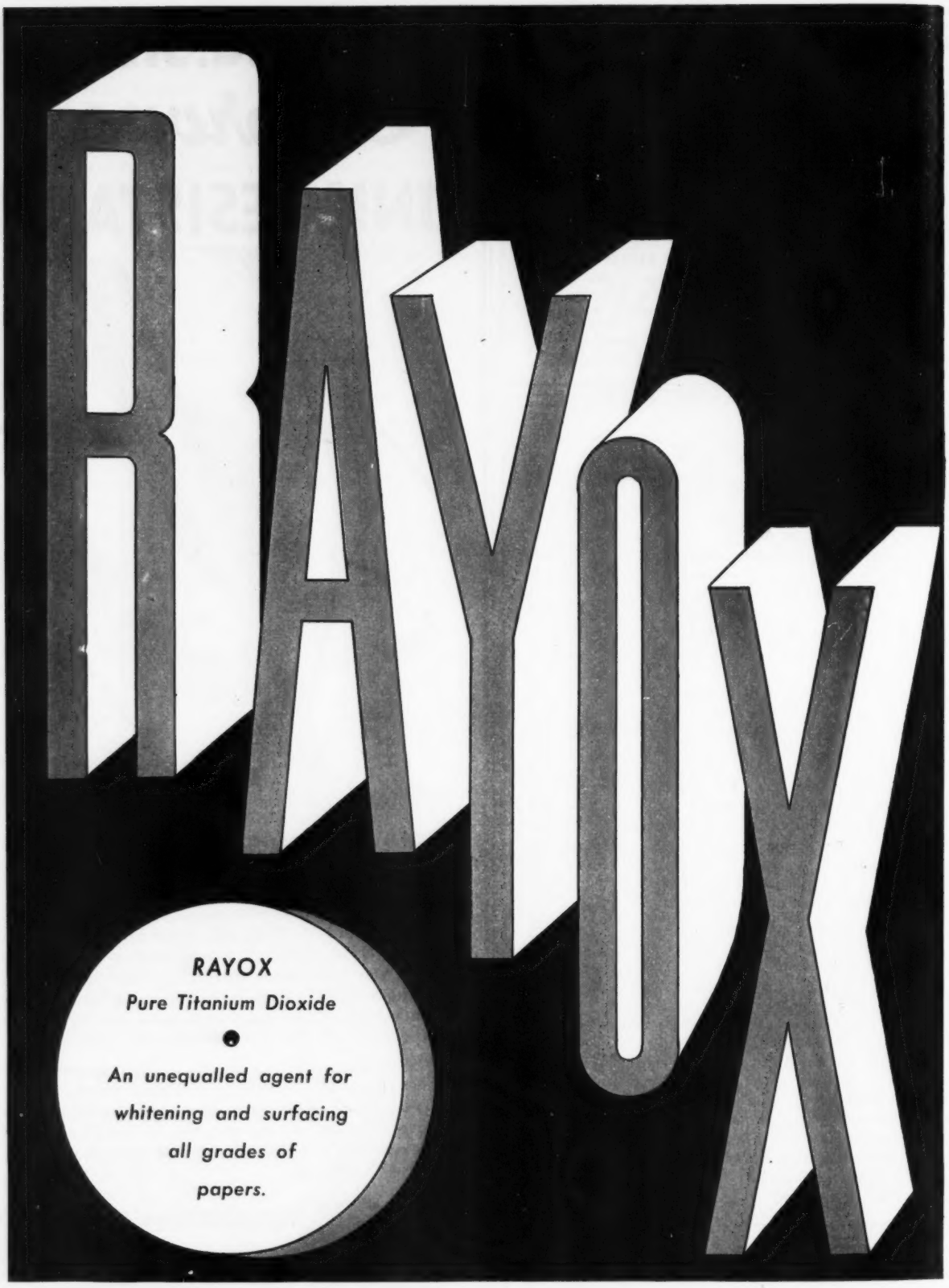


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